July, 1959

The Mining Magazine

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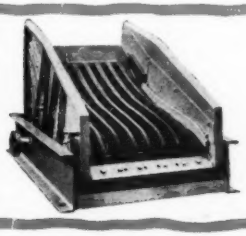

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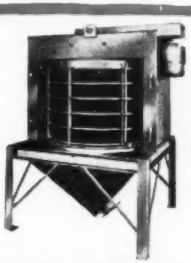

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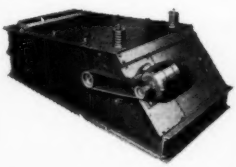

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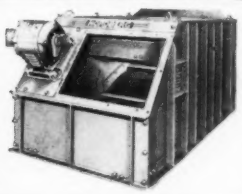

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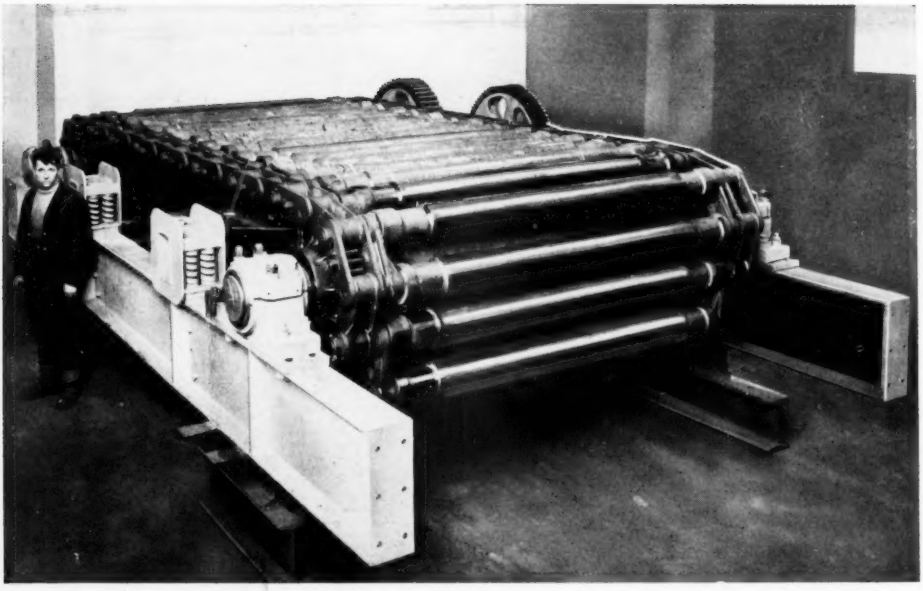

Ross Drop-Bar Feeder for Kneeshaw Lupton & Co. Ltd., Llanddulas Quarries, North Wales

Photograph shows a No. 10 Patent Ross Drop-Bar Feeder on shop assembly before despatch to Kneeshaw Lupton & Co. Ltd., for feeding a 60″ x 42″ jaw crusher at their Llanddulas Quarries. The photograph illustrates the very heavy construction of the apron, in this case 7″ dia. steel bars at 10″ centres, and the heavy shock absorbing coil springs which support the apron.

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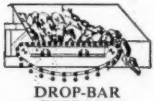
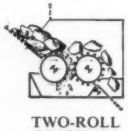


DROP-BAR FEEDERS



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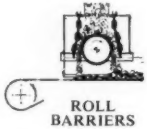

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EDITORIAL

As many readers will already be aware the present issue of the MAGAZINE marks the beginning of its second 50 years. It had been hoped to make something special of this July issue, worthy of the occasion, but publication is now complicated by the dispute in the printing industry. It is impossible, at the time of writing, to estimate how long the struggle will last, but part of one special article, covering 50 years progress in the finance of British mining ventures appears here in what, we regret, can only be regarded as a token issue.

At the annual meeting of the Transvaal and Orange Free State Chamber of Mines held in Johannesburg on June 29 Dr. W. J. Busschau was elected president for the current year and Mr. C. B. Anderson and Mr. P. H. Anderson, became vice-presidents. Mr. P. H. Anderson, the retiring president, in the course of his address to the meeting, said that the progress of the South African mining industry in 1958 had to be reviewed against the background of a slowing down in the economic tempo in the Union, the completion of some major construction programmes having coincided with a recession in world prices for many commodities. The gold and uranium sectors of the industry, however, under the stimulus of an improved labour supply, continued to progress, the past year having been one of remarkable achievement and unusual activity. The upward curve of production had been maintained and much done in the way of sound preparation and planning to ensure orderly development in the future. The gold output from South Africa last year reached the record figure of 17,154,005 oz., more than 500,000 oz. above that of 1957 and, because of the higher average gold content of the ore in the newer mines, that had been won from 572,000 tons of ore less than was milled during the previous year.

In the last decade, Mr. Anderson said, the Orange Free State and the Western Transvaal had been established as two of the world's most important gold and uranium producing areas. As new mines in those areas had approached full production, the announcement of new output records year by year had become the rule. Steady progress was also being made in the development of yet another new mining area—namely, the Kinross goldfield. The first mine there began production in December, 1958, and the controlling house had applied for two further mining leases. The possibility of a fourth mine existed and exploration continued. Although the contribution of the area to the industry's production was not yet significant, the development was likely to be of importance in the future. At present the output from the new areas continued to mount faster than it was declining on the old Witwatersrand, but with age and increasing depth the mines on that part of the field were becoming less and less profitable, the president said, and it was as well to realize the significance of the fact that whereas 44% of the Rand gold came from this area, it contributed only 13% of the profit.

Mr. Anderson remarked that another feature of operations in 1948 had been the further expansion of uranium production, the output for that year being 6,250 short tons, as compared with 5,700 in 1957. He said that the short-term demand for uranium was still obscure, but pointed out that it would appear to be more than adequately covered by production. Marketing conditions were, however, not normal, in that the various producers were operating under long-term sales contracts. The present Canadian contracts expired in 1962–3, the South African during the period 1964–66, and Australia's in 1965. Producers were now looking for markets to cover any output in excess of those contracts and their main concern was what the situation would be on the expiry of their existing contracts. The extent to which demand might fall was unknown, but the president said the South African uranium industry would by that time be in a much stronger competitive position than it was now, as its plants would have been fully amortized, while much of the Rand uranium was produced largely as a by-product of gold. Indeed, unlike her major competitors South Africa had the resources of the well-established gold-mining industry to help make the production of low-priced uranium profitable. Although the prospects for the immediate post-contract period were not too clear, he was optimistic that the long-term future of the uranium industry would prove far more encouraging as time went on.

MONTHLY REVIEW

Introduction.—Presidential intervention having for the time being averted the steel strike threatened in the United States, metal prices continue steady. Confidence is steadily maintained in spite of present industrial disputes and the consequent unrest.

Transvaal.—The gold return figures for the Rand and O.F.S. mines for May show a production of 1,641,990 oz., making with 30,371 oz. from outside mines a total of 1,672,361 oz. for the month. The number of natives at work in the gold mines at the end of May was 385,278, as compared with 383,710 at April 30 last.

The table below shows dividends declared by the Rand mining companies for the past half-year. Figures for the three preceding half-years are added for comparison, the denominations of shares being £1 unless otherwise stated.

	2nd half, 1957	1st half, 1958	2nd half, 1958	1st half, 1959
	s. d.	s. d.	s. d.	s. d.
Blyvooruitzicht (2s. 6d.)	1 0	1 0	1 0	1 1
Brakpan (5s.)	0 4½	0 4½	0 6	0 4½
Buffelsfontein (10s.)	1 6	1 6	1 6	1 6
City Deep	0 6	0 6	0 7½	0 7½
Consolidated Main Reef	1 3	1 3	1 6	1 6
Consolidated Murchison (5s.)	1 9	2 9	5 3	2 9
Crown Mines (10s.)	1 3	1 6	1 9	1 9
Daggafontein (5s.)	2 9	2 6	2 6	2 3
Dominion Reefs (5s.)	1 6	1 6	1 6	1 6
Doornfontein (10s.)	1 0	1 0	1 6	1 6
Durban R'd'poort D'p (10s.)	1 6	1 6	1 6	1 6
East Champ d'Or (2s. 6d.)	0 4	0 3	0 3	0 3
East Daggafontein (10s.)	0 9	0 7½	0 7½	0 7½
East Geduld (4s.)	2 0	1 9	1 11	1 9
East Rand Prop. (10s.)	2 3	2 0	2 0	1 9
Eastern Rand Ext. (5s.)	1 3	0 9	1 0	0 9
Eastern Transvaal (5s.)	—	—	—	—
Geduld Prop.	6 6	5 0	6 3	4 9
Grootvlei Prop. (5s.)	1 3	1 1	1 3	1 1
Hartebeestfontein (10s.)	3 0	3 6	3 6	3 6
Libanon (10s.)	0 3½	0 3½	0 3½	0 3½
Luipaards Vlei (2s.)	1 1	1 1	1 0	1 0
Marievale Consolidated (10s.)	1 3	1 1	1 5	1 4
Modderfontein B. (3d.)	—	—	1 0	—
Modderfontein East	0 9	0 9	0 6	0 6
New Klerksdorp (5s.)	—	—	0 9	1 0
New Pioneer Central Rand (5s.)	—	2 6	—	2 9
Rand Leases (10s.)	0 3	0 1½	—	—
Randfontein	2 3	2 0	2 3	1 9
Rietfontein Cons. (5s.)*	1 1	—	—	—
Robinson Deep B (7s. 6d.)	0 9	—	—	—
Simmer and Jack (2s. 6d.)	0 5	—	—	—
South African Land (3s. 6d.)	1 6	1 6	1 6	1 3
South Roodepoort M.R. (10s.)	1 1½	1 1½	1 1½	1 1½
Southern Van Ryn	0 5	—	0 7	—
Springs Mines (5s.)	0 4½	—	0 4½	—
Stilfontein (5s.)	1 10½	1 10½	1 10½	1 10½
Sub Nigel (10s.)	1 6	1 6	—	—
Vaal Reefs (5s.)	2 3	1 6	2 0	1 6
Venterspost (10s.)	0 10½	0 10½	0 10½	0 10½
Village Main Reef (1s. 3d.)	0 1	0 0½	—	—
Vlakfontein (10s.)	0 11	0 11	1 0	0 11
Vogelstruisbult (10s.)	1 2	1 0	1 0	—
West Driefontein (10s.)	3 6	3 9	4 0	4 3
West Rand, Ord. (10s.)	2 3	2 0	2 3	2 0
Western Reefs (5s.)	1 3	1 3	1 3	1 3
Witwatersrand Nigel	—	0 1½	—	0 1½

* Capital Repayment.

Shareholders of the ANGLO-FRENCH EXPLORATION COMPANY have been informed that following discussions with CONSOLIDATED GOLD FIELDS OF SOUTH AFRICA the last-named company proposes to make an offer to purchase the whole of the ordinary stock in Anglo-French, on the basis of one fully-paid ordinary £1 share in Consolidated Gold Fields, *plus* 5s. in cash, for every two £1 stock units of Anglo-French. At present, it is stated, nearly half of the total investments held by Anglo-French are in companies which are either managed by or closely associated with the Gold Fields group and the two boards are of the opinion that acceptance of the offer will be in the interests of shareholders of both companies. The directors of Anglo-French are to recommend all their stockholders to accept the offer.

Basutoland.—At the recent annual meeting of DE BEERS CONSOLIDATED MINES it was announced that the company had entered into an agreement under which it would have an interest in exclusive diamond prospecting operations in Basutoland. Shareholders were reminded that in the past three years Mr. Jack Scott, of Johannesburg, had carried on prospecting operations on a large scale in most difficult physical conditions. No payable deposit had so far been proved, but a number of diamondiferous occurrences had been investigated. Recently, De Beers had negotiated an arrangement with Mr. Scott by which, subject to the approval of the Government of Basutoland, an interest would be acquired in his concession.

Ghana.—In respect of the proposed issue at 3s. 3d. each of 1,285,714 shares of 2s. 6d. each in ARISTON GOLD MINES (1929) shareholders have been informed that the Ghana Government, following its policy of co-operation with the mining industry, has agreed to participate in the underwriting to the extent of 25% of the issue. WESTERN SELECTION AND DEVELOPMENT is to underwrite the remaining 75%.

In the chairman's review accompanying the report and accounts of BREMANG GOLD DREDGING for 1958 shareholders are informed of certain arrangements for strengthening the balance-sheet and to ensure sufficient cash resources for future dividends. WESTERN SELECTION AND DEVELOPMENT has agreed to defer the repayment of its de-

benture and has been granted the right to convert £100,000 of the £200,000 debenture into shares at par. Bremang's operating profit for the first five months of the current year are given as £125,458, against £87,721 for the corresponding period in 1958.

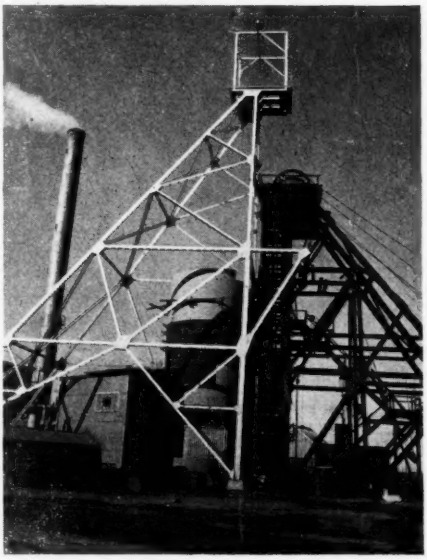
Sierra Leone.—The DIAMOND CORPORATION announced last month that a new agreement on the marketing of diamonds mined by alluvial diggers in Sierra Leone had been signed by the Sierra Leone Government and the Corporation. Under the Agreement, which is for a period of five years from August 1, 1959, the Government is to establish a Government Diamond Office in Sierra Leone and appoint the Corporation to act as managers. All diamonds produced in the country under the Alluvial Diamond Mining Ordinance will in future be exported and marketed solely through this office. The Sierra Leone Government, the statement says, is convinced that it is in the interest of the country generally that it should participate in the marketing of diamonds produced in the territory and it is thought that the new arrangement will also bring additional stability to licensed alluvial diamond mining in Sierra Leone.

Australia.—Considerable progress in the erection of the new headframe at LAKE VIEW AND STAR's Chaffers Shaft—probably the most important shaft on the Golden Mile—is evident from vantage points a mile away. The long steel members have been reaching into the air for some weeks now, dwarfing the old structure that has served since about 1930. The completion of this work in a few weeks now will mark another very important milestone, not only for L.V.S., but for the whole industry of "The Mile."

United Kingdom.—At the extraordinary general meeting of GEEVOR TIN MINES held on June 12, all the special resolutions were duly passed and will now be subject to confirmation by the Court. It is hoped that the capital repayment will be made early in August.

IMPERIAL CHEMICAL INDUSTRIES, LTD., has entered into an agreement with the ALUMINUM CO. OF AMERICA (ALCOA) to collaborate in the manufacture of wrought aluminium products. The two companies propose to establish a new company to be registered as the IMPERIAL ALUMINIUM CO., LTD.

It has been announced that the IMPERIAL SMELTING CORPORATION has gone into partnership with the BERYLLIUM CORPORATION, an American company, to form a new company—CONSOLIDATED BERYLLIUM, LTD. It is expected that Consolidated Beryllium will produce nuclear grade beryllium metal and beryllium-copper master alloy as raw materials for sale to fabricators both in the United Kingdom and in Europe and operate the beryllium metal plant now under construction at Avonmouth, which is due to begin production later this year. The company is also planning what is claimed to be the largest beryllium metal plant in the world.



Headframe at Chaffers Shaft.

METAL PRICES

July 1,

Aluminium, Antimony, and Nickel per long ton; Chromium per lb.; Platinum per standard oz.; Gold and Silver per fine oz.; Wolfram per unit.

	£	s.	d.
Aluminium (Home)	180	0	0
Antimony (Eng. 99%)	190	0	0
Chromium (98–99%)		7	2
Nickel (Home)	600	0	0
Platinum (Refined)	28	10	0
Silver		6	6¼
Gold	12	9	7
Wolfram (U.K.)		—	
(World)	4	18	6

Tin, Copper, Lead, Zinc } See Table, p. 32.

Mining Finance Over 50 Years

H. A. Hake

Conditions in the period of the MAGAZINE'S existence are reviewed

Two world wars and the emergence of a welfare state have transformed the financial world generally in the past half-century. As an indication of the vast changes that these events have entailed, partly due, it must be admitted, to the deterioration in the value of money, the general shape of Mr. Heathcote Amory's budget last April can be compared with that presented only a few months prior to the birth of the MAGAZINE. Mr. Amory proposed finding £5,300 millions, after reducing taxation by £295 millions in the current year and by £360 millions in a full year. Mr. David Lloyd George in his budget of 1909, which needed an eventual appeal to the country and precisely 12 months to be approved, outlined an increase of £12 millions to raise the contemplated expenditure to £165 millions, this total being about one-half of Mr. Amory's " remissions." Incidentally, Mr. Lloyd George in that year introduced super-tax, which in various guises has done much to transfer power from the hand of the individual financier and promoter into the hands of the limited company, the institution, and the holding corporation.

Against such a general background, it is inevitable that company finance should have been radically changed and this has been accentuated in mining finance, for instance, by the tremendous increase which has taken place in the consumption of metals and in the expectation of further expansion of demand in the future. Even in 1909 the scale of some operations was beyond the purses of rich men and the joint stock company was being used to raise finance. A number of South African mining finance houses was already in existence : Johannesburg Consolidated Investment was incorporated as far back as 1889, four others had been set up during the 1890's, and Central Mining had been established about four years by 1909.

It was not until much later, however, that the present group system of finance came to be so highly developed. Moreover, great though the ramifications of the " houses " were in 1909, the last 50 years has seen them greatly extended, both geographically and economically. The Anglo American Corporation of South Africa and Anglo-Transvaal Consolidated had not been formed in 1909, although Consolidated Mines Selection, which has always had close links with the Anglo American Corporation since the latter's formation in 1917, was 12 years old when the first MAGAZINE was published. Almost 20 years were to pass before the two main groups were established to develop the Northern Rhodesian copper deposits. In 1909, Mr. (later Sir) Ernest Oppenheimer had yet to turn his brilliant and courageous attention to the integration of the diamond industry.

As a reminder of the conditions which existed over part of the mining company world in the early years of the century a quote from a report of a company meeting held around the first issue might be given : " There was a refreshing absence at yesterday's meeting of any appeal to the shareholders to ' take up a few more shares '." Not only did the directors then appeal to shareholders for more money, in contrast to present-day conditions when directors are criticized if they allot some of the equity to non-shareholders, they also had the technique of reconstruction. Here the method was to form a new company to take over the assets of the old and to offer to shareholders in the old company shares in the new, with an unpaid liability. In this way, shareholders could be persuaded to preserve their interest by putting up more cash.

The speed with which reconstructions were found necessary in those days is now regarded as little short of amazing ; nor did the process end with just one reconstruction. Mining companies, of course, still come to their shareholders for money, but the technique has changed considerably. Now the " rights " issue is widely adopted as the method of appeal to existing holders. The policy of

issuing shares below the market price to shareholders, it can be argued, confers no " bonus," for if the new shares were to be issued at the market price fewer would have to be sold in order to raise the same amount of money. Psychologically, however, it makes for the success of the new issue, for, however much the accountants and economists might argue, the man in the street feels that he is indeed getting a bonus.

Times have changed also in so far as it is not always necessary to continue pouring money into a company whose future is not well assured, for in recent years it has been possible to sell companies, mining and otherwise, for sums greater than the realizable assets, largely because the buyer wishes to avoid the heavy costs of incorporating a company, particularly the stamp duty on the authorized capital. The market for " shells " varies greatly ; changes in Stock Exchange rules have made their purchase, and with it an automatic quotation, less promising from the buyers' point ot view. Moreover, owners of dormant companies have become aware in lively fashion of the possibilities of " selling the incorporation " and the supply is usually now in line with demand.

Dealing in " shells " has been a fairly recent development ; other changes have taken rather longer. The amount of information given to shareholders has grown enormously during the past five decades. In 1909, even reputable South African concerns had not adopted the practice of releasing reports and accounts and other similar documents simultaneously in Johannesburg, London, and Paris. Incredible though it might seem now, until that method was adopted shareholders of companies incorporated in South Africa who lived in London and Paris were asked to give their proxies before they had the full balance sheet particulars in their possession. It is no wonder that with scant information and frequent requests for money, company meetings tended to be conducted with great vigour on both sides of the table and that sometimes fighting broke out ; it is recorded that one chairman kept in training in order to remove over-critical shareholders himself. In recent years there have been " lively " meetings of mining companies, but they have been the exception and they have been conducted with a dignity which was lacking in earlier days.

Some of the improvements which have taken place are the result of changes in the Companies Act. There was a new Act in 1908, another was found necessary 20 years later, and yet another 20 years after that. As already mentioned, the Stock Exchange authorities have also tightened up their rules covering companies whose shares are traded on the exchange and that process itself has been long, continuous, and thorough.

Reference has already been made to the group finance system, which has been adapted to the general needs of the mining industry in Southern Africa. The technical advantages were clear early on, but the benefits which could be derived from the financial side became apparent as the demand for money grew steadily greater after the more obvious mineral deposits had been discovered and as more modern methods of prospecting and exploration were employed. The need for diamond drilling which followed the ending of outcrop discoveries was another expensive item which gave impetus to the system. The widening spread of interests of the groups gave to potential investors a much better sense of security than putting cash into one mine or even one industry, although such single-minded deployment of cash is still not unknown. As an example of the working of the group system the Anglo American Corporation only recently was able to raise a loan from Germany, incidentally the first large international loan of this kind from Germany since the commencement of the first world war, in order to lend it to De Beers Consolidated Mines. In addition, a group would be able to help a " lame duck " in a way and on terms which would not be possible otherwise. This assistance would not do more of course than give the lame duck the best chance of survival and growing into a satisfactory mine, if the physical conditions permitted.

The growth of the group system has been accompanied by a more general desire on the part of managements to follow a dividend policy which avoids violent fluctuations as a consequence of changes in metal-market conditions. Naturally, groups have decided on their own special policies, but the general tendency has been to keep back at least part of the profits available after a boom in metal prices. The system has permitted the employment of such surplus funds, either permanently or temporarily, in other spheres which were either expanding or enjoying less

favourable conditions. The development of the Orange Free State goldfield, for example, owes much to the diversion of very substantial sums realized after 1945 from diamonds held by the De Beers group. These sums were channelled through the De Beers Investment Trust.

Less dramatic but equally important in opening up new mining fields in areas where native workers have demanded increasing standards of living, has been the group's ability to find the money needed to provide ancillary services—such as, houses, hospitals, and recreation facilities. The group system has certainly eased the way for the establishment of joint plants and even, on occasion, joint shafts, although it is possible that such undertakings could have materialized without the group system. With its help, the task was the easier.

At one time mining was so speculative that prior charges were not viewed with much favour, but as the investment angle became more stressed and as individuals were less able to save capital on their own accounts, the attitude towards loan capital became freer. Institutions such as pension funds and life assurance societies needed to take care of the money entrusted to them and loans were negotiated. This has had the effect of keeping the equity capital down to quite small proportions even though the mine had required sums of money which prior to the last war would have been considered fabulous. This led the lenders of money to feel that although they were receiving interest when the equity was dividend-less and, in many instances, were being repaid amounts equal in size to the dividend which was eventually paid on the equity, some change was desirable, for although institutions profess to be interested only in income, they would be less than business-like if they refused to take a potential capital profit which could either be realized and re-invested to make a larger income, or retained for the same purpose.

The stage was thus set for the Convertible Note. This gave the holder three rights: First, the right to interest on the money; second the ability to convert into equity capital on given terms, and, third, the right to repayment over a specified period if the conversion option were not exercised or to that part of the Notes which did not carry conversion rights. The right of conversion was usually at increasing prices for consecutive periods, with a final date for decision, since it would be unjust to equity holders to have the possibility of an increase of capital hanging over them for an undue length of time.

Important though the contribution made by the group system has been it would be quite wrong to consider that its development to its present high state has been the only great change in mining finance methods. New turns have been given to the old idea of the grub-stake. Governments are now often the backers, but prompt availability of metals and minerals for stock-piling purposes has been the driving force rather than profit. One operation of this kind was the advance of £5,000,000 to Chibuluma Mines towards the cost of equipping and developing its property, the advance being repayable in eventual delivery of copper and cobalt. The advantage to the Rhodesian Selection Trust group, of which Chibuluma Mines is a member, was that in 1951, when the deal was negotiated, the raising of finance from other sources was difficult.

The financing of the South African gold-mining industry with loans to finance the building of plant to manufacture uranium oxide dwarfs the Chibuluma deal. Prices for uranium oxide, which was to be sold exclusively to a special International Agency, were fixed so that over the contract period, the producers would be able to pay interest on the uranium loans, repay the amounts outstanding, and make a profit. By the end of the contract period, the plants would belong to the mines, although clearly the spending of money would be needed in order to keep such plant in good working order. The value of the plants when the uranium contracts expire is a matter of acute controversy, which is not, however, of immediate concern. The essential point is the part which Governments play in taking a large proportion of profits by way of tax and, when requiring to buy mineral stocks, to provide the funds which private enterprise could once have been expected to supply.

The same sort of broad principles were at work when the United States authorities decided to pay the very substantial premium of 100% for high-grade columbite. Since no other buyer could afford to offer such terms, the U.S. became the sole buyer. No obligation was imposed so far as we know on any producer to use the proceeds in a specific way, but producers took the opportunity of extending their properties, and their development, and of modernizing their plants,

so that they could be ready to continue supplying columbite in large quantities after the U.S. contracts had run out. Without this guaranteed and lucrative market, the reorganization of many Nigerian tin-columbite producers would have been much delayed.

Nationalism is a point on which the mining industry in particular can speak and grumble, but there has been one point at which intervention has been to the ultimate good of the mining venture concerned. For years the Rio Tinto Company operated its copper mines in Spain successfully and well, the rewards varying, of course, with the price of metals and with changes in political conditions. In the early 1950's Rio Tinto had established small exploration companies in Canada and South Africa; it was already looking outside of Spain. By 1954, a group of Spanish banks acquired a two-thirds interest in the mines and the way was more widely open to develop interests beyond the Spanish boundaries. At present these extra-Spain interests are concentrated mainly on North America, the West Indies, Southern Africa, and Australia.

The effect of Government action on mining finance has been far from exclusively beneficial. For many years the attitude of the United Kingdom Government was less generous than that adopted by competitor countries in regard to taxation of profits earned overseas and in the allowances permitted in calculating those profits. Some of those disadvantages were abolished when the status of Overseas Trade Corporations was instituted in 1957. Wide though the concessions were, the lack of action in past years was even greater and further relaxations are needed.

The two world wars brought with them special tax burdens. The South African Government in the first imposed a war-time tax on its gold mines and in the United Kingdom excess profit tax was designed to raise additional funds for the war effort. This it undoubtedly did, although it had then, as did the Excess Profits Tax provisions of the Second World War, the side effect of encouraging spending. When the wars were over the austerity imposed was relaxed to a degree, but almost inevitably tax rates continued at a high level in comparison with the rates ruling when hostilities commenced. These high tax rates in the United States, combined with growing nationalism in the producing countries caused many old-established companies to attempt to transfer their domiciles from the United Kingdom to overseas places, where the tax climate at least was more favourable. Such moves were prevented by Treasury action and even now the Union Corporation and Johannesburg Consolidated Investment have the doubtful privileges of being domiciled for tax purposes both in the Union of South Africa and in the United Kingdom. Some permissions were granted, notably to the Rhodesias, and, for oil companies, to Trinidad. Tanganyika Concessions, which was founded as the last century was drawing to a close, emigrated to Southern Rhodesia in 1950; the control of Rhodesian Anglo American, the Rhokana Corporation, and Rhodesia Broken Hill Development was transferred to Northern Rhodesia in 1951, and these were followed by the Rhodesian Selection Trust group, including Roan Antelope Copper Mines and Mufulira Copper Mines, in 1953. The institution of the concept of Overseas Trade Corporations has taken some of the steam out of the desire to migrate, although the normal reason given for the transfer was an improvement in having management on the spot and not for tax reasons.

It is remarkable that, in spite of the growing feeling of nationalism, the mining industry which operates from this country or through British influence in most parts of the globe has been singularly free from nationalization. In Yugoslavia, it is true, Trepca Mines was nationalized during 1946 and there have been examples of local Governments combining with mining interests to set up joint ventures. One example is Anglo-Burma Tin Co. (1956), which took over the assets of the company with an almost identical name; the Burma Government holds the majority of the shares of the 1956 company. Another instance is Mawchi Mines (1957), where the Burma Government and Mawchi Holdings, former owners of the property, hold the capital in equal shares.

The biggest act of nationalization, however, was that of the British coal industry by the Socialist Administration elected immediately after the end of the Second World War. The same Government also introduced dividend limitation to the Statute book, an action which limited the freedom of directors in fixing the rate of dividends and hampered the making of new issues. This defect was not so large as feared, however, because of the prior operation of controls over the new issue market. Under the Act, directors were

obliged to plough back any "surplus" profits.

In this way, some partial solution was given to a problem which had been of growing importance to those in charge of financial policies of the mining companies: the task of replacing assets in a time of high taxation and inflation. Twice in the last 50 years, war, inflation, and scarcity of goods have induced this trouble. Eventually, some degree of stability in the value of money and even of deflation followed the first world war. So far no such movement has followed the second. In such conditions the normal provision of depreciation based on historic cost has been woefully inadequate, and boards have been obliged either to make new issues, or to retain relatively large proportions of earnings for this purpose.

This problem has been a general one, but it has been made worse for the mining industry for special reasons. One of these is the policy followed in a number of countries of imposing an export duty based on the export price of metals produced without reference to the cost of production. One of the worst sufferers in this respect has been San Francisco Mines of Mexico: increasing inflation has at times given a high price to metals, but wages and other costs have cut deeply into the revenue, and export duties combined with income tax have greatly increased the depth of the cut. Even Commonwealth countries indulge in the practice: Malaya levies its export duties on the tin producers, who provide a large part of the national revenue. Australia levies a royalty on its lead-zinc producers. This latter is on a sliding scale designed in days when the word "sterling" was applied to stability of value, and not to one of the great monetary systems of the world. Its effect during the 1955–56 boom in lead-zinc prices was felt severely by the Consolidated Zinc Corporation, which at one stage was paying away 48% on one part of its profits in this way alone.

War- and welfare state-induced inflation have produced three major monetary changes in the last 50 years. The need to conserve the gold resources of the belligerent countries led to the withdrawal of gold as day-to-day money: the days of the sovereign, except on watch-chains, as collectors' pieces, or for holding by oil-rich Middle East rulers, was over. The second dramatic change occurred in January, 1934, when President Roosevelt devalued the dollar, giving gold a price of $35 per fine ounce, as compared with $20·67 per fine ounce; he had the power to raise the price of gold to $41·34 per fine ounce, a power which was never used and later taken away. Higher prices for gold than $35 per ounce have been subsequently paid: for a period since the Second World War, gold was sold at a premium for "industrial" purposes. Eventually, the number of countries authorized to sell at higher rates expanded so much and, at the same time, the temperature of international politics fell to more normal levels, that supply and demand became more nearly related and the premium failed to cover the extra costs involved.

London Stock Exchange

Valuation at March 31, 1959.

	No. of securities.	*Nominal amount, £m.*	*Market valuation, £m.*
Australian	30	37·4	121·8
Miscellaneous	112	54·3	259·8
Rhodesian and E. African	55	100·6	392·2
South Africa	166	274·2	1,168·4
West African	31	16·7	18·7
Diamond	16	25·7	212·9

The third major monetary change was in September, 1947, when sterling was devalued from $4·03 to the £, to $2·80 to the £. Since the dollar price of gold was unchanged the sterling price for gold improved. Gradually the advantage gained by the producers has been whittled away by rising costs of production; gradually, more and more voices are being raised, asking for an increase in the dollar price of gold.

Thorium from Elliot Lake

It was announced last month that Canada's first thorium plant, at Elliot Lake, Ontario, in the Blind River uranium field, has begun production. It was built in six months by Humphreys and Glasgow (Canada), Ltd., for Rio Tinto Dow, Ltd., and cost in the neighbourhood of $1,000,000 to produce approximately 150 tons of thorium salts a year, a substantial proportion of the current world production.

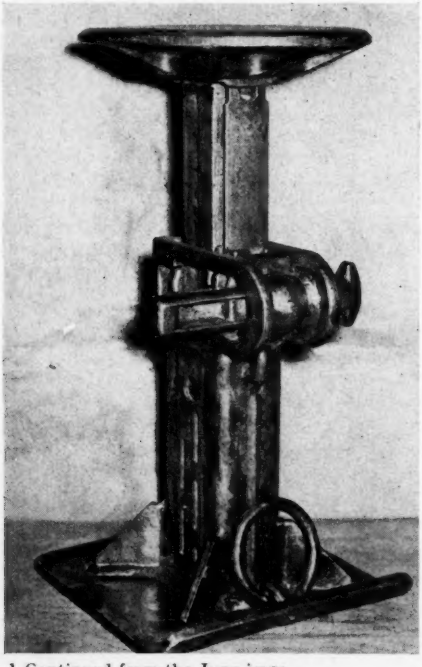
It is the first installation in the world to recover thorium from the waste liquors produced in uranium milling and, because mining, crushing, grinding and leaching will have been carried out in the normal course of uranium production, the cost of thorium recovery will be low.

Mining Machinery Exhibition[1]

Some further notes on the exhibits planned.

Roof Control

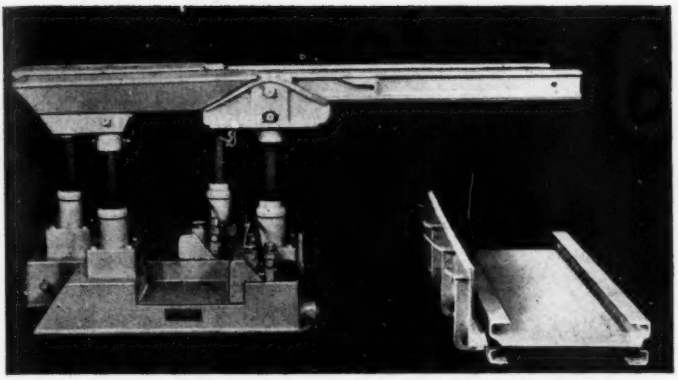
A range of props and articulated linking roof bars are shown by **Steel Props and Mining Equipment, Ltd.** Particular attention may be directed to the friction-yielding chock illustrated. Within the limits of its maximum extended length and its minimum fully-collapsed length it is completely adjustable and gives a direct positive support without need of timber or packing material. The yielding principle is of the continuous-rising characteristic and therefore the more it yields under pressure the more the resistance is built up. The roof-plate is a tempered drop-forging, oval in shape, of a bearing area of 186 sq. in. This is loose fitted into the head of the upper prop member by a central pin which allows a limited amount of horizontal movement to ensure a better bearing surface when the roof is uneven. The floor plate is sledge-shaped to allow the chock to slide easily on the floor and is also of a standard size of 186 sq. in. but can be supplied in other dimensions. The purpose has been to supply a flexible chock giving an immediate setting load of 10 tons to 12 tons, which in 1 in. of yield builds up to 40 tons to 50 tons.



Examples from their range of hydraulic pit props together with the self advancing supports are shown by **W. E. and F. Dobson, Ltd.** Largest in the range of props is the 25-ton yield hydraulic unit which has an initial setting load of 8 tons throughout its life. The 18-ton yield hydraulic prop has been introduced to meet the need for a lower priced prop of lighter weight and smaller load primarily for use on conventional faces, while the smallest in the range, the 10-ton unit, is intended for temporary support or " catch prop " duties. The self-advancing support which is illustrated consists of two side by side fabricated bases, each of adequate width to give stability to two hydraulic legs at 27 in. centres. These are mounted in each base in such a way as to accommodate relative movement of roof and floor. Rigid fabricated bars span between the front and back legs of each unit, giving a large bearing surface to the roof. The two base units are intercoupled with an intermediate push-pull ram to enable them to be advanced. The first unit to be advanced is termed the " slave unit " and the one used as the anchor in this operation is known as " the master." In order to advance the conveyor every sixth slave in an installation has an additional ram which is called the " ram slave." The hydraulic medium of water and 5% soluble oil is supplied through a closed-circuit flexible hose by a 5 g.p.m. pump working at a pressure of 1,000 p.s.i.

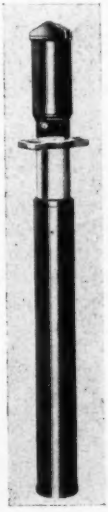
The prop shown in the illustration is set by hydraulic pressure provided by a readily transportable air or electric motor-driven

[1] Continued from the June issue.



Dobson Self Advancing Roof Support

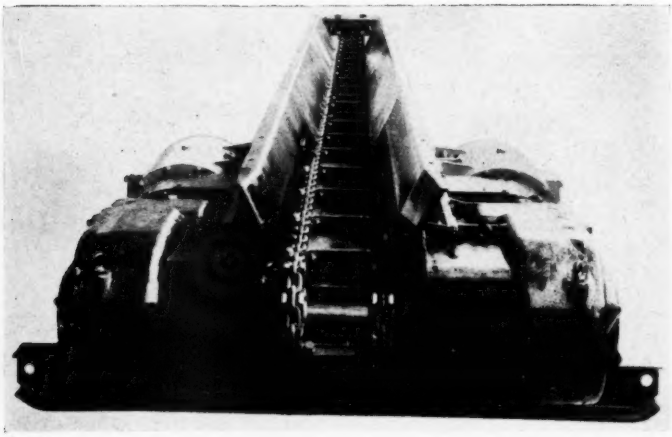
pump which, acting *via* the setting gun draws hydraulic fluid from the reservoir in the prop and forces it at low and then high pressure into the working cylinder. The gun is only connected to the prop for the setting process and each pump serves a number of props. The pump gives setting loads exceeding 25 tons and does not rely on the human element. The key feature is the control unit in the upper tube. This embodies all the major components such as the setting valve and subsidence valve which also acts as the withdrawal valve. The valves and the control unit are renewable underground. A subsidence valve protects the prop against bending or bursting and is set to work at a higher pressure than the setting valve and permits telescoping speeds of 6 ft. to 8 ft. per sec. The prop is produced in a range of sizes, the smallest being 2 ft. 7 in. extending to 3 ft. 3 in. and the largest 5 ft. 3 in. extending to 8 ft. 6 in. It is exhibited by **Nortons-Tividale, Ltd.,** who also show a rotary tippler and a tub pusher with electro-hydraulic drive.



Conveyors and Conveyor Structures

The Cable Belt rope-driven conveyor embraces the principle of utilizing steel-wire ropes to take the tensile pull which, in the conventional conveyor, is taken by the belt itself. Two stranded steel-wire ropes, one on either side of the conveyor, are used for this purpose and the rubber belt is of special construction and sits on and is supported across the two steel-wire ropes by means of a continuously-moulded rubber rope shoe form along each belt edge. Moulded transversely within the belt at suitable pitch are small square-section spring-steel rods, which cause the belt to run flat when empty but to take up a troughed form under load. It is shown by **Cable Belt, Ltd.,** and demonstrated by means of a working model.

An extensible belt-storage conveyor in which reels of 100 ft. of belting are stored is included in the exhibit by **Joy-Sullivan, Ltd.** The storage box is immediately in front of the drive head of the conveyor and there are six belt pulleys mounted in the box—two each of 10 in., 12 in., and 14 in. diameter. Three of the pulleys are on fixed shafts at the drive end of the box, while the other three—one of each size—are mounted on a moveable carriage running on rails inside the box for its full length. A steel-wire cable is attached to the carriage to travel by belt tension to a position immediately ahead of the fixed cluster of



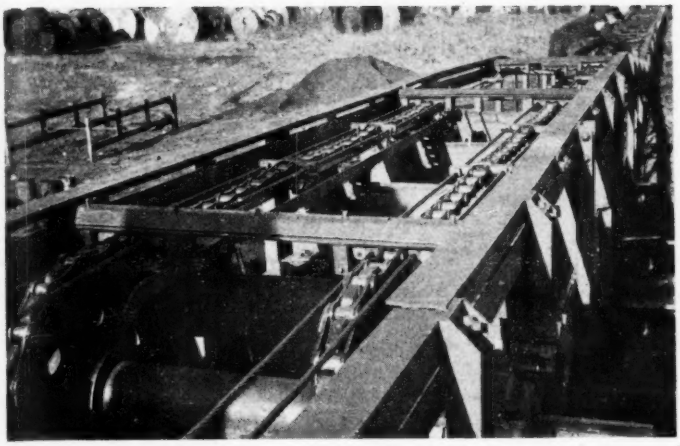
Meco Chain Conveyor

pulleys. The ram can be extended 40 in. by hydraulic pressure to haul forward the travelling carriage and pulley cluster for 17 ft., sufficient to store up to 100 ft. of 24-in. or 30-in. width belting. It is shown in conjunction with the company's Continuous Miner, to which it is linked by a bridge conveyor, making a complete mining set-up.

Many different types of conveyor and conveyor structures will be found on the stand of the **Mining Engineering Co., Ltd.** Of particular interest in metalliferous mining is the exhibit of the driving head and short length of 7-in. armoured unit shown in the illustration. This has two 40-h.p. motors and gearboxes with fluid couplings and is equipped with 20-mm. heavy-duty round-link chain. Two complete running belt-conveyors will be seen, one with 75-h.p. two-drum driving head and 30-in. drums and traction-type fluid coupling and thruster-operated brake and the other a 15-h.p. two-drum unit in which a twist section turns the outcoming bottom belt up into the return top belt of the bottom loading conveyor run.

Within recent years **Hugh Wood and Co., Ltd.,** have developed a series of drive heads specially designed for use in surface installations to transmit from 5 h.p. to 50 h.p. for both wide and narrow belting, the two shown at the exhibition being typical. A feature is that they are made in interchangeable units to accurate specification so that replacement is simplified and maximum adaptability from site to site is made possible. In chain conveyors there is the company's armoured Python conveyor which is seen operating on the Huwood slicer exhibit and two complete chain conveyors which are not shown in motion. One of these is the P.F. which is a rigid conveyor that requires no tensioning and is easily extendable. The P.F. chain, which has a breaking strain of 14·5 tons for the double chain, is made up in 5 ft. lengths, each containing three flights at 20 in. centres, and the 2 in. pitch chain makes a great contribution to a low delivery height.

A company well-known for conveyors for both underground and surface duties is **Mavor and Coulson, Ltd.,** who show a full range of tandem driving gears for roadway belt-conveyors, the smallest being the new No. 2T which takes 30 h.p. at 200 ft. per min. On all of them the cheeks are strongly ribbed castings connected together by heavy cross stays spigoted to them, forming self-contained and rigid structures which keep the gearing perfectly in alignment. Transverse joints allow division into three or more parts for ease of transport. Next to the motor or fluid coupling in most cases there is a brake to bring the belt smoothly to rest and to hold it on a gradient. The twin driving drums are large enough to conform to good practice and the belt has the large arc of 480° in contact with them. There are also three smaller single-drum drives, now available for roadways underground to take 8 h.p., 15 h.p., or 28 h.p. at 300 ft. per min. A dismantled length of stringer structure shows into what convenient space it goes for transport. The idlers shown include all types—*e.g.*, for cushioning the belt where loaded, for steering reversible belts, for carrying abrasive or sticky material, or for picking belts, and for widths from 20 in. to 48 in.

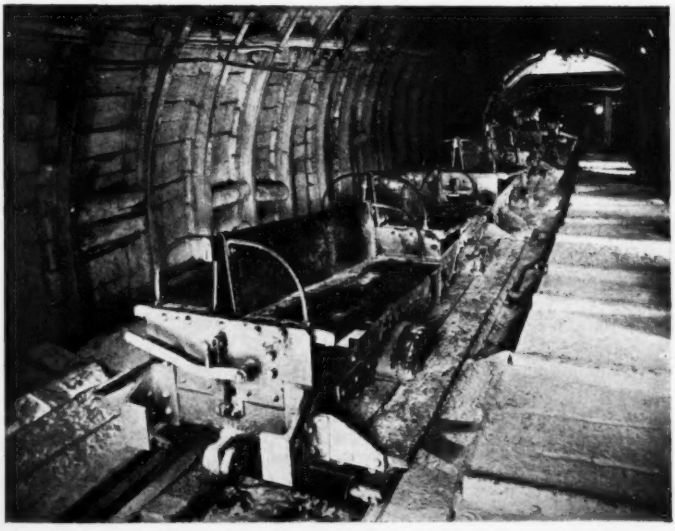


Glover Brothers G Conveyer

Not previously seen at an exhibition is the G conveyor, a full-size model of which in sectionalized form is shown on the stand of **Glover Brothers (Mossley), Ltd.** This is designed primarily for main trunk systems of high capacity and considerable length for all types of mining work. As may be seen from the illustration its main feature is that it is positively driven by means of a specially designed rope chain which relieves the belt, whose sole function is to carry the material. The hauling is done by the chain, resulting in low power consumption, it is suggested, and allowing the use of a comparatively thin belt. Associated in the same exhibit are **British Ropeway Engineering Co., Ltd.,** who present a fully automatic pliable aerial ropeway complete with conveyor system in model form, and **Ropeways, Ltd.**

Locomotives and Mine Cars

By means of a working model **Associated Electrical Industries, Ltd.,** from their Heavy Plant Division demonstrate a man-riding carriage equipped with automatic track brake system. A typical train is shown in the illustration. The same division have an



Man-Riding Cars with Metrovick Automatic Track Brakes

exhibit of a working model of a tower-mounted four-rope friction winder similar to one installed at the Rufford Colliery of the N.C.B. **Metropolitan-Vickers Electrical Co., Ltd.,** show a storage battery locomotive which derives its power from a lead-acid battery of 100 cells and is driven by two traction motors designed for underground work, each having a one-hour rating of 46·5 h.p. at 200 amps, 200 volts, 610 r.p.m. On the man-riding carriage the makers state the automatic track brake system developed is simple in operation and gives the maximum degree of protection. In fact, by virtue of the very high coefficient of friction of the brake shoe lining, a train running at a speed of, say, 6 m.p.h. can be brought to rest within a distance of 20 ft. on gradients as high as 1 in 2·5; on lesser gradients it can be stopped in a reasonable distance from speeds of 24 m.p.h. or more. A recent development has made it possible to provide emergency stopping in the event of a rope failure on sine gradients steeper than 1 in 3.

Signals and Communications

A new type of private automatic telephone exchange, designed to provide efficient communications with complete safety both below and above the surface in collieries and other establishments where stringent regulations to minimize risks of explosion are in force, has been developed by **Automatic Telephone and Electric Co., Ltd.,** in collaboration with the National Coal Board and is being demonstrated by **Communication Systems, Ltd.** Known as the Type No. 58, the P.A.X. operates from a 24-V non-earthed battery supply and combines automatic, magneto, and priority calling, thus enabling the facilities of automatic telephony to be taken right to the coal face. The new A.T.E. system has been certified by the Ministry of Power as being intrinsically safe. Surface instruments are fitted with a dial and the required extension is called in the usual way. Single (*i.e.*, non-party line) instruments underground, not requiring the priority-calling device, are operated in the same manner. If the priority service is required, a certified wall or desk instrument fitted with a priority-call push-button is provided.

The A.T.E. Gate Interlock system, developed to promote efficient working of mine shafts with increased safety, is being exhibited by **A.T. and E. (Wigan), Ltd.** This system provides each level and bank with a visual indicator which shows the position of the local gate and keps. A master indicator in the winding room shows the conditions at all levels. If a gate is opened when the cage is not at the appropriate position a warning hooter sounds and the indicators operate. If the keps are left out and the winding gear is operated to lower the cage, causing a slack-rope condition to arise, this is indicated in the winding room by an illuminated panel and the sounding of a hooter. Gate-interlock systems can be provided to suit special requirements and these can be incorporated with a shaft signalling scheme. The basic principles are shown by a working model using a miniature indicator panel representing pit bottom, bank, and winding room. Other items being exhibited by this company include the Type 57 shaft signalling system, the underground locomotive haulage signalling system Type 56, and a coal-face signalling system.

Belting

Another company which demonstrates recent developments in belting construction is **Rubber Improvement, Ltd.,** who have on their stand examples of Rilflex and Leonex belts. The former is a high-tensile Terylene-based multi-ply construction which is not subject to changes in its physical properties as a result of atmospheric conditions. Leonex is a p.v.c. cotton-based belt available in grades based on 28 oz., 32 oz., or 42 oz. cotton ducks and in many combinations of plies, widths, and cover thicknesses. The company also show Leonex brattice cloth and sheeting and ventilating tubing of the same material.

Rock Drilling and Tools

Included in a range of flameproof equipment by **Siemens-Schuckert (Great Britain), Ltd.,** is a newly developed drilling machine. This is a hand-held rotary having a range of speeds from 430 r.p.m. to 720 r.p.m. which has a new motor design and fan cooling system. It is suitable for work in coal and all but the hardest grades of stone. The company also show an automatic feed unit for use in conditions where hand-held drilling is not adequate and an adjustable stand for use with these machines. Drilling rods for long-hole work and water couplings for wet drilling are also featured.

A drilling machine of novel type, which was first described in the MAGAZINE in December,

1954, and is used in underground ironstone mining in Lincolnshire is that shown by **F. Taylor and Sons (Manchester), Ltd.** It is an electric rotary and is carried on a boom which enables it to be presented at any desired angle to the face. The same company also show their Jumbo shot-firer's roof scaling carriage, which is diesel-engine powered and is equipped with a roomy platform hydraulically operated which can be raised to 18 ft. above floor level.

On a stand devoted mainly to coal-cutting machinery **Siskol Machines, Ltd.,** also show a mobile drilling unit for use in opencast mining and quarrying. The power is supplied by a petrol or a diesel engine which is mounted on a light two-wheeled chassis, the drive being through an overload clutch set to slip at an appropriate load.

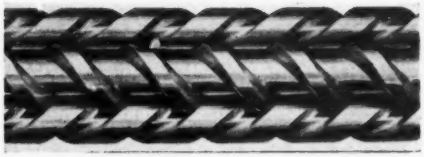
Shaft Sinking

A company well known for its work in shaft sinking is showing at the exhibition a number of models to illustrate their process. Among present contracts is that for sinking for the N.C.B. at Wolstenton Colliery, near Stoke-on-Trent, a 24-ft. internal diameter shaft with reinforced-concrete lining to an ultimate depth of 3,450 ft. This is the **Cementation Co., Ltd.,** who will also include in their display steel false-work tubbing, ventilation tubing, and cores and drilling equipment presented by their associates **John Thom, Ltd.**

Pumps

A self-priming mining pump suitable for duties above ground and below is demonstrated on the stand of **British LaBour Pump Co., Ltd.** The makers state that simplicity is the keynote of its design, there being only one moving part—the impeller—which is of the open type and this, together with the absence of close clearances, makes it suitable for handling liquids with solids in suspension. It is fitted with a Crane mechanical seal having tungsten carbide hard faces which has been shown to be the solution to gland sealing problems where gritty materials are concerned. The separator of the pump is fitted at the side to reduce headroom. The same company make a pump for the chemical and metallurgical industries suitable for the handling of corrosive and errosive liquors.

A range of screw-type pumps and associated



SIG Screw Pump

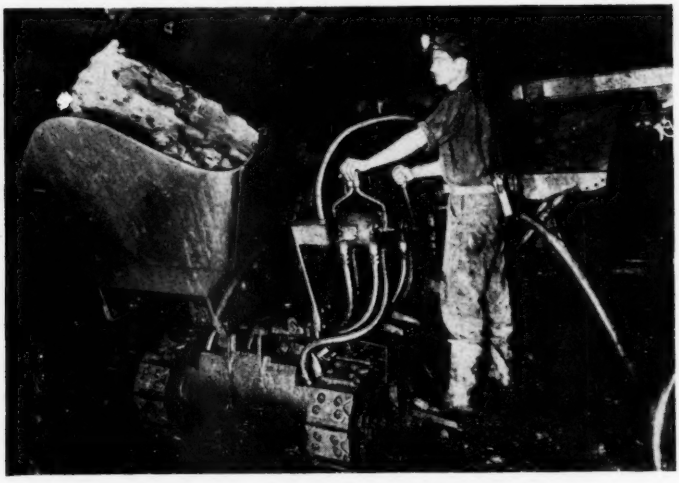
equipment is to be seen on the stand of **Telehoist, Ltd.** This is the SIG which is made in three basic ranges. The low pressure up to 300 p.s.i., medium to 1,000 p.s.i., and high pressure up to 2,500 p.s.i. The pump itself is a positive displacement unit and consists of three rotors revolving in a casing. The rotors have double threads ; the middle one drives the two side rotors which themselves ensure fluid tightness in the axial direction (see photograph). In brief the advantages of this type of pump are : Self priming, uniform delivery with freedom from pulsation and turbulance, high working speed and therefore small size, and simplicity of construction. The company also show "Velflo" circular duct fittings for air conditioning and dust-extraction plant.

Loaders

A number of different types of loaders are to be seen, mostly those designed for coal gathering. Among these is that shown by **Joy-Sullivan, Ltd.,** which is described as an entirely British machine developed from the well-known American gathering-arm Joy loader. The 12 BU–7 loader will work in seams as low as 30 in., will load direct on to chain conveyors or where height allows into mine or shuttle cars, and has a rated capacity of one ton per minute and a maximum loading capacity of 1½ tons. It is a caterpillar-mounted machine with five interchangeable individual motors supplying gathering arms, conveyor, caterpillars, and hydraulic pump.

Another loader for coal getting is that shown by **Hugh Wood and Co., Ltd.,** which is described as one of the first and still one of the most successful British machines designed for longwall working. The loader is now fitted with a hydraulic propulsion which simplifies operation as it offers greater mobility and less preparation before loading can begin.

A loader well known in ore mines is the Rockershovel shown by **Eimco (Great Britain), Ltd.,** the model 622 being illustrated. This



Eimco Rocker Shovel 622

is compressed-air operated and is now available with a 32-cu. ft. capacity hopper mounted at the rear of the machine which gives it a substantial increase in loading rate. A flameproof electric version is also available. Another loader on this stand is the model 635, which like that shown in the illustration, is crawler mounted and is available with a minimum headroom requirement of only 5 ft. The company also show the model 21 conveyor for use with their rocker-shovels which is now of revised design and fitted with parking brakes so that it can be spotted and used with the model 622 referred to above.

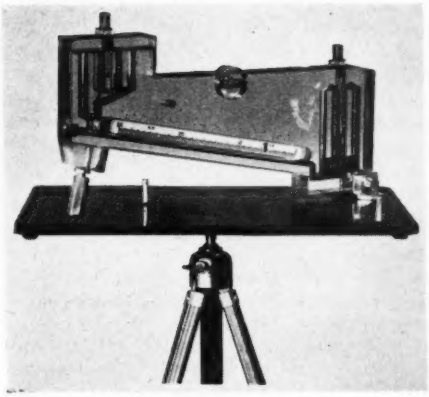
Another loader known in metal-mining circles is the Autoloader by **Atlas Copco (Great Britain), Ltd.** This is described as a one-man machine, is mounted on rubber-tyred wheels, and is capable of a performance of 55 cu. yd. of material per hour over a haulage distance of 70 ft. The model exhibited is the T2GH which has a discharge height suitable for dumping on conveyor-belts. It can be dismantled quickly if shaft dimensions make transport difficult.

As part of a tunnelling exhibit on their stand **Mavor and Coulson, Ltd.,** feature the Samson loader connected by a bridge conveyor to a short length of gate conveyor. The loader has a short jib which can be raised or lowered hydraulically as usual but does not need to be slewed and is therefore made rigid sideways. Underneath it is an arm carrying the ball of a ball-and-socket joint, by means of which it can pick up one end of the bridge conveyor and carry it clear of the ground. The structure of the bridge conveyor is a lattice framework supporting a troughed belt-conveyor. The belt will be shown running at 250 ft. per min. It is driven by the head pulley through reduction gearing running in oil from a 5 h.p. hydraulic motor. The hydraulic supply pipes run to the tail end where there is a quick make and break self-sealing connexion to a pump on the loader driven by the loader motor. When installed underground the outbye end of the bridge conveyor is either hung by a pivot from a wheeled block running along an overhead girder, or (as will be exhibited) it is supported on a carriage astride the gate conveyor. At both ends plates guide the material and the joint allows a relative movement of up to a right angle to each side. The bridge conveyor will be running and the loader will be moving about a yard to and fro on a curved path, showing how the bridge conveyor follows its movements, both endways and sideways, allowing the face of the tunnel or heading to be cleaned up without the loss of a moment. In a separate transmission gearcase the gearing of the Samson loader can be seen turning slowly, to explain the simple mechanical control of the crawlers and conveyor and the strong construction. The hydraulic haulage Samson is a newcomer which has not been exhibited previously in this country. Test rig and gauges will demonstrate its flexibility and infinitely variable automatic control. This coalcutter cannot be overloaded. Height 17 in., width 26 in., length 8 ft. 6 in., 90 h.p. A 19-in. Samson, 75 h.p., will carry a gumslinger, for

disposing of the holings with high efficiency, leaving the cut clean, improving preparation of the coal, and reducing shotfiring.

Hygiene and Safety

Designed for the measurement of small pressure differences is an instrument which is proving useful in underground ventilation surveys. This is an inclined tube liquid-column manometer which can be mounted on a tripod as shown in the illustration. Differences down to one two-hundredth of an inch water gauge can be measured and the instrument is described as being so robust that if accidentally knocked over it can be picked up, re-levelled, and continue in use. There are three ranges : 0 to 1·20 in., 0 to 0·6 in., and 0 to 2 in. w.g. It is exhibited by **Combustion Instruments.**



Ultra-fine Metal Powders

Introduction

The National Research Corporation of Cambridge, Massachusetts, has for many years been active in the development of production processes for the less common high purity metals as well as in the fields of inorganic chemistry and metallurgy associated with refractory metals. Recently the Corporation has developed a new process for the production of ultra-fine metal powders. The particles produced are spherical and the size range is 200 Å. to 600 Å. with all less than 1,000 Å. (0·1 μ) and an average of about 300 Å. It is possible to control size to some extent and particles may be produced up to at least 0·5 μ in size. It is expected that future developments will permit sizes as low as 50 Å. to 100 Å. If future tests show it to be desirable the form of the powder and its size can be controlled and perhaps changed to suit better particular applications.

The unusual properties of ultra-fine powders are the result of greatly increased surface energy in addition to increased surface area. As spherical particle size decreases an increasingly large percentage of atoms are at the surface and therefore have free energy due to unsatisfied bonds. Particles must be appreciably less than 1,900 Å. in order to make this unique type of energy available from the powder. As a result of the increase in surface energy there will be an increase in heat of combustion, increase in rate of reaction, increase in absorption, and a tendency to act as a thickener when added to liquids. These property changes offer new opportunities in propellant formulation, catalysis, organo-metallic reactions, powder metallurgy, and electronic applications.

Because of the fine particle size, metal powders are pyrophoric. They are consequently shipped and stored under an organic liquid compatible with the metal. This is usually n-heptane, but other liquids have been used. Heptane can be vacuum evaporated, leaving a free flowing, non-caking product. For applications where a relatively high proportion of oxide is acceptable or desirable, oxidation can be controlled to some extent. This frequently pacifies the material, making special packaging unnecessary.

Powders Available

The National Research Corporation has manufactured a number of different ultra-fine metal powders and the process can be applied to many others. Included among these but by no means a complete list are aluminium, iron, nickel, magnesium, lead, zinc, copper, silver, and gold. In general the ultra-fine refractory metal powders such as titanium, zirconium, columbium, tungsten, tantalum, and molybdenum cannot yet be made by the process. The possibility does exist, however, that techniques being developed

can be applied to produce these powders in the future.

The unique properties of National's powders suggest a number of applications, which generally fall into three areas—chemical, metallurgical, and electronic. The following are examples only and in no way represent an exhaustive list.

Chemical Applications.—Both the extremely high surface energy and high surface area (about 750,000 cm. per gram.) indicate that the catalytic and absorption possibilities of this material should be investigated. It has also been found that suspensions of ultra-fine aluminium powder, for example, in kerosene can be obtained without observable settling or agglomeration over long periods. Thixotropic mixtures have also been made as well.

The Corporation has recently developed techniques for encapsulating solids (magnesium hydride, ammonium perchlorate, and ammonium nitrate, for example) with metals such as zinc, aluminium, and magnesium.

These encapsulation techniques might also be applied to ultra-fine metal powders. It may be possible to produce compounds more readily at lower temperatures than is possible with more massive materials or to produce some compounds not previously known. If a compound is unstable at temperatures normally required for reactions to take place, the compound could be unknown, since it would decompose at a faster rate than it is formed under the conditions of the reaction.

The ability to react at a low temperature should also permit the formation of compounds not previously available except in solution—*e.g.* AlH_3—now only available in diethyl ether. It has been found, for example, that a 10% yield (the calculated equilibrium condition) can be obtained by direct hydriding of magnesium powder at a temperature of only about 300° C. and an absolute pressure of about 300 mm. of hydrogen. The literature shows direct hydriding of previously available coarse magnesium has required a temperature of 570° C. under hydrogen at 200 atmospheres. The formation of organometallics is another area of potential chemical interest.

Metallurgy.—Powder metallurgical applications are of interest principally because of the particle size range. Homogeneous mixtures of alloy elements should be possible, permitting direct pressing of powder metal alloys from mixed powders. New properties might be obtained by mixing powders in proportions not ordinarily found in alloys. Dispersion hardening possibilities also exist.

Electronic.—Extremely high field permanent magnets are a distinct possibility as are non-ionic conducting fluids. Both magnetic iron and magnetic nickel powders have been produced. It is believed that when magnetic particles are smaller than the magnetic domain they are likely to be magnetically hard or, essentially, to require considerable energy for demagnitization.

Colliery Shaft in the West Midlands

A reference in the June issue to the shaft being put down in the West Midlands division by the Cementation Co., Ltd., for the National Coal Board, lends interest to the notes given here, which describe the methods employed. The new shaft, at Wolstanton, Staffordshire, is No. 3; it is 24 ft. in internal diameter and lined with reinforced concrete. An older shaft (No. 2) was sunk in the 1914–1918 war, primarily for the production of ironstone and since deepened by the same company.

No. 3 Shaft.

This shaft, it is intended, will have an ultimate depth of 3,450 ft. and on completion it will be the deepest shaft in Great Britain. The first sod was cut on May 14, 1957, and construction of the shaft collar was started on May 30 and completed to a depth of 87 ft. 6 in. by August 30. In addition to the shaft collar four 10-ft. diameter shafts with 18 in. reinforced lining were constructed around the shaft collar to support the permanent headgear. The construction of these shafts commenced on August 6 and was completed to a depth of 65 ft., together with capping and construction of the tie beams, by October 28. The site was then handed over to the tower contractors, Sir Alfred McAlpine, Ltd., on October 31 and the permanent headgear was completed sufficiently to enable sinking to commence by mid-June, 1958.

The shaft passed through 1,200 ft. of marls before entering Coal Measures and so far ground conditions have been weak, but they are expected to become firmer below the inset now under construction at 1,800 ft. Until

April this year, sinking has proceeded on orthodox lines, with a single-deck scaffold, whereby a length of 55 ft. to 60 ft. was sunk and lined by the end of each week and ancillary operations effected over the week-end. Successful co-ordination of the various operations, training of personnel, and elimination of time wasting factors have largely contributed to a substantial increase in progress. In the first four months of the current year 950 ft. was completed.

In April, during the Easter holidays, a two-stage scaffold was introduced, with the lower deck suspended by eight ropes at an interval of 40 ft. from the upper deck, the arrangement being to sink a length of 40 ft. and wall up the exposed ground. By this method the falsework plates are left in the shaft after concreting and lowered by means of six 100-ft. sling ropes coupled to the mucking unit suspension rope when walling the next length. The sequence of operations is as follows : (1) Sink 40 ft. and level off sump ; (2) set and concrete No. 1 ring ; (3) lower No. 2 ring and continue walling by lowering falsework in 5 ft. lifts ; (4) lower the mucking unit on completion of walling, and (5) resume sinking.

The stage is operated by four locked-coil ropes reeled on a 550-V. 100-h.p. four-drum capstan with differential gearing and electrical selection for individual drums when levelling. The capstan ropes serve as guide ropes and carry the rider which steadies the hoppit. A mucking unit is suspended from the wall below the scaffold and operates a 12-cu. ft. grab, which loads into 85-cu. ft. " hoppits ". The mucking unit is lowered and raised by a 70-h.p. 30-ton Dunlop and Bell single-drum capstan located on surface.

Main services are provided by a 6-in. air column, 1½-in. water main, a 24-in. ventilation line, and a 6-in. flame-hardened range for concrete. The concrete pipes are clamped every 10 ft., air and water main every 20 ft., and the ventilation range at 40-ft. intervals. Ventilation is provided by 7-h.p. Woods Aerofoil fan delivering 3,500 cu. ft. of air per min.

Hoisting is effected by a 3,300-V. 1,000-h.p double-drum clutched winder with dynamic braking, using 1⅛-in. locked-coil ropes, the winder having a speed of 33·4 ft. per sec. Arrangements for muck disposal include top doors with trunnion tipping of hoppits into Euclids provided by the National Coal Board.

Drilling is done by Holman Silver Three machines fitted with ⅞-in. chucks and using hexagon steels tipped with tungsten carbide chisel bits. A drill basket is used for lowering drill steels and eleven drilling machines with air and water hoses attached to their respective manifolds. The equipment is carefully assembled on surface so that no time is lost in the sump in connecting up the air and water pipes to the mains to enable drilling to commence within a matter of minutes.

Series firing is employed for blasting a round with Polar ammon gelignite and half-second detonators. The average round varies from 60 to 90 shots, with an explosives consumption of 1·5 lb. to 2·5 lb. per cu. yd.

Roof bolts with link-mesh are used as a temporary measure to support open ground and standard timber rings are used as well for weak strata.

A central aggregate and sand storage is employed for Nos. 2 and 3 Shafts and the sand and aggregate is conveyed to the respective batching plants by means of 18 in. belt conveyers. At No. 3 Shaft a 4-bin Stothert and Pitt weigh batcher feeds two 40/28 concrete mixers which are located at either end of the batching plant. Concrete is transported down the 6-in. flame-hardened range and led off at the bottom through a dashpot and flexible hoses to the falsework rings. Standard vibrators are employed and a consistently high grade of concrete is maintained. Sulphate-resisting cement is used in the shaft owing to the high sulphate content of the water in the strata.

No. 2 Shaft.

The original No. 2 Shaft was 16 ft. in diameter, bricklined, and sunk to a depth of 1,350 ft. In 1926 it was coupled to the coal workings for ventilation purposes. The Cementation Company commenced operations here in 1956, deepening the shaft at 16 ft. diameter to a depth of 1,731 ft. The shaft was then widened eccentrically to 20 ft. diameter and sunk a further 120 ft., when a further eccentric widening was carried to 24 ft. diameter. The shaft was sunk a further 60 ft. at the new diameter, when operations were suspended in October, 1957, to enable the erection of the headgear and winding engine.

Deepening was resumed in March, 1958, and continued to March this year, when the shaft had reached a depth of 2,952 ft. 6 in. Sinking operations were then suspended to enable relining of the initial 100 ft. of the shaft to be carried out, together with the sinking of four small shafts, similar to No. 3 Tower foundations. This work is in progress

at present.

Orthodox methods have been adopted in this shaft, using a single-deck scaffold and sinking and lining lengths of 60 ft. Walling has been carried out by means of pipeline concrete and again excellent results have been achieved, it is reported.

Ore-Dressing Notes

(1) *Gravity Concentration.*

The Shaking Table (2)

A thought-provoking point which arises from the study of tabling literature and field practice is the wide variety of riffle-plans in use. Some call for deep troughs, some for shallow ones. Usually these are straight and aligned with the reciprocating throw of the deck, but all sorts of curves have found their advocates. Zones are used, unriffled sections differ, and some workers use unequal heights —for example, with every fourth riffle double the height of the other three. No common principle appears to underlie these variations. From consideration of a simple riffle as a kind of mechanized sluice (Notes (1) and (2) of this series) it should be possible to clarify the situation. The purposes of the riffles are :—

(*a*) to arrest and spread the entering feed ;

(*b*) to transmit the stroke action to the load ;

(*c*) to differentiate the transfer of energy by promoting selective adhesion of particles to riffles ;

(*d*) in furtherance of (*c*) to keep the load in the riffle sufficiently loose to stratify ;

(*e*) to promote forward flow of the load ;

(*f*) to aid the pulsed flow of water along the riffle ;

(*g*) to expose the uppermost sand, after stratification, to the cross flow of wash water, and

(*h*) to make steady delivery at an economic rate, at the right portion of its length, to succeeding riffles, wash planes, or discharge points.

For (*h*) to succeed, deck action must be accurately controlled and unbalanced as between acceleration, check, and deceleration. Feed must be steady, properly sized or sorted, and held to the correct solid/liquid ratio. These points will be returned to later. Their immediate significance is that they are essential means to the end that each riffle shall receive the right motion for developing the correct separating action, at speeds which vary between 120 and 275 reciprocations per minute in standard practice.

The deck cannot, therefore, be considered in isolation, since the riffles must be able to pick up and impart the desired motions at high speed. This ((*a*) above) rules out as bad practice the use of stopping riffles to arrest and spread the feed. If they are not all of similar height, then the stratifying action cannot be the same for all riffles and only a percentage of them can act efficiently. The right procedure is to use a feed box integral with the deck, aligned with the vibrator, and so designed as to let the feed down gently to the head riffles. It can also be made to deal with excess water, should this arrive sporadically, but prevention is better than cure of such an undesirable occurrence. Coming next to (*b*), (*c*), (*d*), (*e*), and (*f*) *supra*, doubt should be cast on the wisdom of using curved riffles. This curvature increases wall friction and thus acts against the force transmitted by the vibrator. It also causes packing of the sands and to that extent prevents stratification in a dancing, teetering stream. By reducing the effective cross-section it promotes scouring action by the pulsed water, directed against the smaller particles shut out by the packed sands (those having maximum mass). These fine particles may well be the ones which need the gentlest and most protected progress toward the discharge end, rather than the overspill transport they thus receive. In practice, it is common to compensate one error by the introduction of another and then to blame the ore for its inconsistency. There is some excuse for this in our present state of knowledge when flotation is practised, since variations of lattice-structure have an important effect on reaction, but this escapism is not possible in gravity separation at sizes where surface-tension effects are negligible. The particle has shape, surface, density, and volume. These determine its gravitational and frictional responses and if a table is used it must operate within the working limits imposed by those responses. A badly maintained mechanical action may lead the operator to redesign his riffle plan, just as an incorrect stance may lead the golfer to use a queer swing. The best riffle is one truly aligned with the vibrator and moving on a deck in which random backlash is not permitted. The material of which deck-surface and riffling are constructed affect the frictional grip, which may change with ageing, particularly with rubber exposed to sunlight.

Despite the obvious advantages (lightness, resistance to wear, rigidity) of aluminium, linoleum decking with hardwood riffles still dominates when materials are chosen. For the shallow riffles used on slime tables, and for the final taper on sand tables, thin brass strip is widely used.

E. J. P.

(2) *Uranium.*

Moving Bed IX

In the spring of 1958 a Wyoming mill began production from a system equipped with mobile resin in its IX columns. This is the sixth plant to depart from the fixed-bed method of treatment of uranium-rich solution. Capacity was designed for 750 tons daily, but as much as 1,200 has been reached. The advantages claimed for the method include improved efficiency, owing to the fact that the flow of pregnant solution is never interrupted by the need to displace liquor by back-washing and that the resin is more completely loaded. Following this advantage, smaller quantities of eluting reagent are needed and there is a higher concentration ratio ("pregs"/eluate). One large column deals with all the back-washing, allowing a saving in construction costs for the smaller ones which handle adsorption and elution. Less resin is also required and the risk of blockage is reduced since this resin is more thoroughly loosened up during transfer. A further point claimed is that attrition of the beads is reduced in comparison with R.I.P. working with its alternate expansion and contraction of the material in the presence of pulp, since the process is applied to clarified liquor and the beads only move once daily through backwash, elution, and return to adsorption.

Leaching begins with use of returned IX barren solution coming up from the final C.C.D. section through two agitators in series, which discharge to a thickener. The overflow from this goes to storage while the underflow receives secondary leaching through three agitators in series, with sulphuric acid correcting addition. Counter-current decantation follows through four thickeners to final sand discharge. The barren IX solution runs counter-current to the sands. About 70% of the uranium is removed in the primary leach and substantially all the remainder in the secondary stage. The pregnant solution is drawn from storage in a wood-stave tank through leaf clarifiers which use diatomaceous earth as a filter aid. It would not be possible to dispense with this clarification step, as can sometimes be done in fixed-bed treatment, as slimes might accumulate in the bed of sand underlying the resin in the adsorption column.

Ten columns are used in the installation. Two groups of three, in parallel, are on adsorption and three on elution. The tenth back-washes the saturated resin which it can receive from, or return to, any of the first six columns. The load per column is 250 cu. ft. of Permutit SK anion-exchange resin. In addition two spare columns are connected to the system, for periodical regeneration of resin poisoned with molybdenum. Pregnant feed is split between the parallel lines for adsorption. When the first column of the three in line is saturated it is cut off, water-flushed, and its resin load is then pumped to the back-wash column. Stripped resin is then pumped over from the first fully eluted column and, some 16 minutes from commencement of the operation, the column is again on stream, this time at the far end of the adsorption. The loaded resin is washed for an hour in the back-wash column and then transferred to the eluting series of columns for a two-hour stripping cycle.

Precipitation commences with addition of magnesium hydrate to neutralize the low-nitrate eluate, batchwise. The resulting precipitate is settled, decanted, and moved to pachucas where gypsum is removed by means of lime and sodium hydrate. After re-acidification, the slurry is thickened, filtered, and the filtrate is reprecipitated with sodium hydrate, thickened, and filtered to provide the final cake?[1]

(3) *Handling.*

Nylon for Conveyor-Belts

The qualities looked for in a conveyor-belt include its tensile strength/weight ratio; its absorption of energy; resistance to damage from repeated flexing; resistance to abrasion; resistance to rot and fungus; resistance to temperature effects, acids, sunlight, and moisture. In a trade brochure[2] the superiority of nylon over some other yarns is discussed. Strength is expressed as tenacity in grams/denier, the denier being the weight (gm.) of 9,000 metres of yarn. Both wet and dry breaking load of nylon is at least twice that of cotton. Its elasticity (in the sense of

[1] DAYTON, S. H.; *World Mining*, Feb., 1959.

[2] *Outlook*, Nylon Spinners, Ltd., Spring, 1959.

recovery from stretching) is also superior, as is also its impact strength. Ability to yield and recover is not necessarily a desirable quality in conveyor belting, but this can be reduced by heat treatment during manufacture. The outstanding value of nylon is its resistance to repeated flexing and bending. Detailed tests are cited over sub-zero to high temperatures in support of the claim to overall superiority over cotton, rayon, and polyester yarns. None of the greases, chemicals used in the plant, or oxidation products of ores is likely to affect this material in normal service. The need for non-inflammable belting in coal mines has led to the substitution of poly-vinyl chloride (P.V.C.) as bonding agent and cover underground in place of rubber, which it was already replacing before the Cresswell colliery disaster in 1951. Rubber cover remains the first choice for surface installations but increasing attention is being given to the the relative merits of woven and multi-ply textile bases. The solid woven base is a relatively thick and heavy fabric with its plies bound together while weaving. The system most widely used has plies of duck fabric laid together and covered with P.V.C. or rubber. These 5-ply (X-2) belts are now being improved by replacement of some of the cotton by nylon, and also by changing the basic construction. With nylon in the weft the belt has better resistance to longitudinal tearing and less liability to pulled-out fasteners. Similar use in the warp or the weft of solid woven belt is now made.

Engineering Log

On July 11 London's Big Ben celebrated a centenary of time-keeping. In its 100 years it has sounded out the hours from the Parliamentary clock tower often enough to have caused the clapper to strike Big Ben's bell over 5,500,000 times without any visible or audible effect of wear from this regular 4-cwt. punishment, beyond a shininess at the point of contact. During Big Ben's first two months a clapper weighing 7 cwt. was used and cracked the rim of the bell. The clapper was changed and the bell turned. This original bell, cast at Norton-on-Tees in 1856, weighed 16 tons. However, a misguided amateur, Lord Grimthorpe, caused the weight of the clapper to be increased beyond the tolerance of even so large a bell and a 4-ft. crack developed. In his Whitechapel foundry, whither the casualty was removed, Mr. George Mears broke up the bell by means of a ton-weight ball of cast iron and in the fullness of time the fragments were used for Big Ben, the near 14-ton bell being cast on April 10, 1858. A sketch published in the *Illustrated London News* by an eye-witness of the operation shows that the three furnaces used all fed the molten metal into one launder leading to a mould below floor level which had been dried and pre-heated several hours before the casting by blowing in hot air. Ingot moulds shown in the illustration circling the top of the bell mould effectively prevented the mould walls from bulging under pressure from the last stages of pouring. The mould was left untouched for several weeks after the casting was completed, while several days were then taken to expose the contents gradually and safely. A special vertical lathe of more than usual size was used to cut away superfluous metal and tune the bell. By the end of May, Big Ben was ready for the journey by horsedrawn bogey, the 16 horses in full triumphal regalia, from Whitechapel to Westminster. The voice of the bell in those days could otten be heard 10 miles away and even more. In 1926 Big Ben was first broadcast by radio. To-day that voice is known throughout the Commonwealth and the world.[1]

* * *

The notorious trouble with waves experienced by ships entering Dover Harbour has been moderated by the installation of two lines of polyethylene piping which release intermittent blasts of compressed air. This breaks the rhythm of the waves and reduces the height of the bigger ones by at least a half. The pipelines are 300 yd. long and held down by steel rails. They are unaffected by the turbulence of ships passing only 10 ft. above them at low tide. The installing company considers that the principle should be of value in protecting off-shore drilling rigs.

* * *

Another method of inducing the waves of the sea to calm themselves with their own energy has been evolved by a French inventor, Jean Valembois. One of the uses to which it might be put is the smoothing of rough harbour seas to enable ships to dock safely in adverse weather conditions. The inventor has assigned the patent to Electricité de France, Paris, a national service. The system

[1] *Tin and Its Uses*, Spring, 1959.

devised makes use of hydraulic resonators, which have the effect of turning the waves against one another. The crest of one wave and the trough of another of the same size in the same place and at the same time can be induced to cancel each other out. The resonators are in effect long boxes with open floors extending beneath the sea's surface and closed tops (in some types of resonator they may be open) above the highest crests. At a given level below the surface the pressure of water varies as waves pass over the surface above and the pressure is highest below the crests of the waves. The floor of the resonator registers these changes. When the pressure is high the water level inside the resonator rises and this drops when the pressure falls. The constant rise and fall of resonator water level creates waves that advance counter to the inoming sea waves and the instrument can be adjusted to produce crests and troughs at whatever frequencies conditions require. The natural frequency is dependent on the resonator's shape and the level of water inside. If ocean wave frequency changes daily, resonator frequency can be adapted, for example, by increasing or decreasing the air pressure in the space above the resonator's inside water level. Harbour waters may be calmed by using two or more resonators at the ends of piers extending into the sea to protect shipping.[1]

* * *

The recent International Convention and Exhibition on Transistors and Associated Semi-Conductors produced 120 technical papers for its gathering of 2,000 specialists. As is now well known these semi-conductors, materials which can be used to rectify or to amplify electric currents, can act as do thermionic valves. Notable among them are pure silicon and germanium, but already these first-comers are already being added to by such compounds as silicon carbide and the phosphide, antimonide, or arsenide of indium. The older rectifiers based on such materials as copper oxide and selenium are being ousted by these new-comers, as is mercury-arc rectification. Best known of the " solid-state " devices is the transistor, which is robust, thrifty of power, and small compared with the electronic valve. The biggest market at present is in radio sets, deaf aids, and military equipment but applications multiply while costs continue to fall. World production of the 800 types should exceed 100,000,000 in 1959, a tremendous growth in five years. One development, the silicon solar cell, generates electricity direct and may become an important power source if the problems of production economics can be solved. The active part of a transistor can be as small as a pinhead and its life 100,000 hours. Over 250 firms in Britain are now concerned with this highly specialized field.

* * *

The annual production capacity of the world for nitrogen is 11,000,000 tons, of which 9,000,000 tons are currently produced. The bulk of this becomes nitrogeneous fertilizers and ammonia synthesis provides 80% of the capacity, the balance coming from calcium cyanide, Chilean nitrate, and coal, gas, and oil by-products. In spite of the great expansion in fertilizer production (which now makes nitrogen level with phosphates and potash in this field), 96% of the arable land of China is nitrogen-deficient and the position in India is as least as bad. The leading producer is Germany (30·7%), the United Kingdom being fifth with 10·2%, a figure representing a five-fold expansion since 1939. The new Shell Chemical plant on the Thames is rated at 75,000 tons of anhydrous ammonia annually, together with other nitrogen compounds.[1]

* * *

The applications of dry glass as an electrical insulator are numerous and widely known. The insulating properties may be impaired in moist atmospheres because of the hygroscopicity of glass, but this is a temporary loss and most types of glass will dry out with insulation unimpaired. Glass of high alkali content may, however, be damaged permanently. Antique Roman glasses have been found with thick incrustations of iridescent flakes of changed glass which has lost its insulating properties. In modern times the decorative effect of this has been produced artificially by annealing the glass in a kiln containing a small amount of tin salt. As long as the aim was solely artistic the modification of electrical conductivity in the tin-treated glass surfaces went unnoticed. Recently, however, a new need has arisen for half-way conductors, substances which are neither full conductors like metals nor full insulators like glass and plastics but of intermediate conductivity. It was soon found that glass surfaces were subject to the type of modification required if they were exposed

[1] *Science News Letter*, May 30, 1959.

[1] *Economist* May 23, 1959.

to the fumes of metal salts and that a tin salt was effective. The initial difficulty was to control the degree of conductivity conferred by treatment. Research has overcome this problem. In consequence two firms, Sylvania Electric Products Inc., of New York, and Thorn Electrical Industries, Ltd., are marketing products dependent on the use of a conductive surface film on glass. The Thorn products are flat sheets of soda glass up to 2 mm. thick, with an electrical resistance of 500 to 1,500 ohms per square [*sic*]. Resistance can be lowered or increased beyond the limits stated. Although production in England is presently limited to panels measuring 8 in. by 10 in. there is no technical reason against manufacturing panels a few feet long. The process used for the panels is also applicable to pressed and blown products, as long as these are not too large and provided some latitude is permitted in the surface conductivity of irregularly shaped products. In other respects than conductivity, alteration of the glass surface is not great. Visual transparency is reduced by 10% to 20%. Iridescence is not enough to prevent use of the treated glass for windows. Washing interferes with neither iridescence nor conductivity of the treated glass. Treatment is given at a temperature just below the softening point of glass and it is generally agreed that at this temperature the tin chloride is decomposed in the presence of water vapour to form a tin oxide which remains firmly attached to the silica network of the glass surface, while the volatile hydrochloric acid escapes. Applications for conductive glass are being developed in several directions. One use that could be made of it is for resistors of electronic instruments, since they can be of any desired shape or size and maintain constant values without deterioration from heat. The heating of the glass as a result of its moderate conductivity can be used as an anti-icing device in windscreens of cars and aeroplanes. Conductive glass windows could be used to heat rooms. Conductive panels can carry current to light lamps apparently unconnected to electric mains. Slight conductivity on an instrument window would allow static charge to leak away. One of the most promising applications is in illumination. In this field conductive glass can be combined with materials which become phosphorescent when activated by mains voltage. Signs made in this way operate almost cold and use little space. A panel of 100 sq. in. may require as little as 3 watts of electricity to illuminate it. Judicious use of stencils on an electronic digital computer panel can be very economical of space and cheaper than using hot filament lighting. The " glass " conductive surface need not be on a glass sheet. The glaze can be enamelled on steel and even when protected by plastic may remain extremely thin. Such a material might be used to outline parked cars at night.[1]

[1] *Tin and Its Uses*, Spring, 1959.

News Letters

BRITISH COLUMBIA

June 4.

Peace River.—Magnum Copper, Ltd., is to resume diamond drilling at its copper prospect in the Racing river area, where the first work, done in 1958, indicated a reserve of 570,000 tons grading 5·14% copper. Magnum Copper and its associate, Centennial Mines, Ltd., have joined with the White Rock Syndicate to place $70,000 in the treasury of Tombac Exploration, Ltd., which was formed to acquire and develop a group of claims 40 miles east of Merritt. Preliminary tests have revealed interesting anomalies in a geologically favourable area. Magnum and Centennial have also announced an exploration programme on another copper prospect near the Racing river holdings, acquired too late in 1958 to conduct any field work. In addition they have joined with other companies to form Northern Explorations Syndicate, which has been conducting geophysical and magnetometer prospecting in an undisclosed area; to date more than 100 claims have been staked over anomalous areas.

Clinton.—American Metal Climax, Inc., is to probe the Boss Mountain molybdenum deposit for evidence of persistence to greater depth during 1959. The property is situated 50 miles north-east of 100-Mile House and in the past three years the company has done 20,000 ft. of diamond drilling which has indicated 1,250,000 tons averaging 0·74% MoS_2 together with a possible 3,000,000 tons grading 0·35% MoS_2. Four mineralized zones have been found, with most of the work concentrated on the " A " zone, a well-defined ore-body forming the centre of breccia pipe in quartz-diorite. Enough work has been done to outline a solid block, 1,200 ft. long, of which 800 ft. is continuously mineralized, the average width being estimated at 50 ft. Zone " B " is about 300 ft. distant from and parallel to Zone " A ", while Zones " C " and " D " are about 200 ft. beyond " B " and bear a similar strike. Bulldozer stripping is to be utilized to search for further zones this year. The 103-claim group was acquired in September, 1955, by Climax Molybdenum Co., prior to its merger with the American Metal Co., from H. H. Huestis and Associates of Vancouver. Annual payments have been made since that time.

Skeena.—The balance sheet of Cassiar Consolidated Mines at February 28 lists current assets at $2,746 against accounts payable of $6,968. The company has an investment of $112,736 in Sheba

Copper Mines, Ltd., whose properties are under development in the Highland Valley. No work was done in 1958 other than that essential to maintain properties and camp in good order. The inactivity is explained by the company president, Mr. W. R. Wheeler, as due to unfavourable operating conditions. He states: "Owing to changes in the Mineral Act of British Columbia in the last two years, mining conditions are unstable. It is hoped that the mining situation in the Province will clarify itself and that mining people who have been sitting back to see if the conditions for risk capital would improve, will shortly return to the British Columbia field."

No work was done by Morris Summit Gold Mines in 1958 and there was no change in property holdings; early re-opening of the property is not expected. Of the authorized capital of 3,000,000 shares ($1 par value), 999,730 shares have been issued. The final option granted to Newmont Mining Corporation of Canada, Ltd., to purchase 200,000 shares at 50 cents each until August 24, 1958, was not exercised.

Supplementary to the recent re-organization of Surf Inlet Consolidated Gold Mines, Ltd., an extraordinary meeting of shareholders on June 2 approved a change in name to Western Surf Inlet Mines, Ltd.

Omineca.—The Huestis Molybdenum Corporation, Ltd., has been incorporated to acquire and explore a 68-claim group of claims at Pitman, 20 miles north-east of Terrace. A 1,300-ft. zone has been found in a fractured area of molybdenite mineralization with grab samples ranging from 0·42%–4·0% MoS_2. Initial work includes detailed prospecting and mapping under the direction of the consulting geologists, Drs. White, McTaggart, and Thompson. The company is capitalized at 5,000,000 shares (50 cents par value), of which 1,220,000 shares have been issued, including 900,000 held in escrow.

Highland Valley.—The Highland Valley Smelting and Refining Co., Ltd., has been incorporated as a wholly-owned subsidiary of the Bethlehem Copper Corporation, Ltd., following a decision of directors to form a smelter division. Underground development of the company's Jersey zone has revealed a higher grade of ore than had been indicated in drill cores. Mr. H. H. Huestis, the president of both Bethlehem and Highland Valley Smelting, states: "Establishment of a copper smelter would mean that only one more major step would be necessary to give British Columbia a fully-integrated copper-producing industry. This final step would be the provision of refining facilities to produce the copper cathodes such as those currently being imported from refineries in eastern Canada and the State of Washington by Western Copper Mills, Ltd., of New Westminster. In view of the progress made by Western Copper Mills in its first few months of production of a wide range of copper and brass-finished products, a British Columbia refinery is foreseen as a logical development in the not too distant future."

During the fiscal year ended January 31 last, New Hamil Silver-Lead Mines expended $72,233 on exploration and administration. The company has invested $25,000 to assist Consolidated Woodgreen Mines, Ltd., into production at Greenwood.

Northlodge Copper Mines expended $17,517 on exploration during the year ended December 31, 1958. Although outside exploration is being continued no work is at present being done on the original Highland Valley holdings until more is learned from the major underground development of Bethlehem Copper, on adjoining ground. The company's president, Mr. Donald F. Farris, states: "Although our treasury is limited, your directors are planning participation with two other mining companies in sending out prospecting crews in two areas of British Columbia and one in Ontario, which are considered of particular interest. In the event these crews are successful, plans for raising additional funds will be made."

Further development of the Aberdeen property appeared assured early in May when Torwest Resources, Ltd., obtained an underwriting from Consolidated Mogul Mines, Ltd., of Toronto. The latter placed $187,500 in the treasury through the purchase of 250,000 Torwest shares at 75 cents per share and was granted options which, if exercised in full, will bring the Torwest company $3,437,500. Sinking is currently in progress at the Aberdeen copper prospect and drilling is being done on the Swakum Mountain group, near Nicola.

Greenwood.—Consolidated Woodgreen Mines, Ltd., has resumed mining at the Motherlode open-pit and is at the outset milling at 500 tons daily; it is planned to increase to 750 tons daily before the end of June and shortly thereafter to full capacity of 1,000 tons. Concentrate is to be shipped to the Tacoma smelter, although the company was tempted to accept a purchase proposal from Japanese interests. The necessity for stockpiling while awaiting deep-sea vessels, together with a reduction of $4 per ton of concentrate granted by Tacoma, persuaded directors to utilize the Washington State facilities. An underwriting has been obtained from Atlas Investments, Ltd., who have made firm commitment to purchase 100,000 shares at 50 cents net to the treasury.

Giant Mascot Mines has acquired an option to purchase a group of claims at Camp McKinney, near Rock Creek in southern British Columbia. The property has a record of production of gold valued at approximately $3,500,000 prior to 1903 and paid dividends exceeding $550,000. All ore came from above the 500-ft. tunnel and when the productive veins terminated against a fault no effort was made to trace offset continuity or further ore deposition beyond that prominent marker. Recently, Mr. W. E. McArthur, Sr., Mayor of Greenwood, after a careful study of the physical aspects and history of the property, drilled five holes beyond the fault and encountered exceptionally good ore in three. A group of workers have reclaimed underground workings and extended a cross-cut through and beyond the fault and have since driven 60 ft. on one vein in ore carrying more than 1 oz. of gold per ton over full mining width. With its complete mining plant available, Giant Mascot plans preparation of the property for direct ore shipments. Giant Mascot has also announced acceptance by Newmont Mining Corporation of Canada, Ltd., of an offer to take over the Newmont interest in Western Nickel, Ltd. Giant Mascot is to place its own operating crew at the Choate property and plans are being made to resume production of nickel and copper concentrates. The Giant Mascot company will also be resuming shipments of barite to McPhail Engineering Co. in Tacoma as soon as certain parts of the bagging plant are restored after destruction last fall by fire.

The annual meeting of shareholders of the Continental Mining Corporation, Ltd., on May 25 approved the action of directors in advancing funds to Mid-West Copper and Uranium Mines, Ltd., for re-opening the Velvet copper-gold mine at Rossland. The meeting also endorsed the proposal to purchase a proved copper property in southern California subject to satisfactory conclusions being reached in a report now being compiled by consulting engineers. Continental is also planning new work on its property adjoining the Phoenix Copper Co., Ltd., at Phoenix, B.C. With two new mills now in operation within five miles of the Continental holdings, it is felt that arrangements can be effected for custom treatment of the copper ore.

Cariboo.—National Explorations, Ltd., former Beaverlodge uranium producer, has commenced geological reconnaissance on two oil and gas permits covering an area 23 miles by five miles, near Quesnel, B.C. The company is also participating in the drilling of a 16-well programme in the Baxter Lake area of Alberta.

Trail Creek.—Mid-West Copper and Uranium Mines, Ltd., plans resumption of mining and milling at once at the Velvet mine ; additional finance has been secured from the Continental Mining Corporation, Ltd. A contract has been effected with West Kootenay Power and Light Co., Ltd., for electrical power. Shipments will again be made to Tacoma although an offer from Japanese purchasers was given serious consideration.

Golden.—Sheep Creek Mines, Ltd., has earned an operating profit of approximately $125,000 from the Mineral King operation in the first three months of 1959. This compares with $50,000 for the full fiscal year to May 31, 1958. Working capital has been increased by about $225,000 since the end of the last fiscal year.

FAR EAST

June 10.

Oil.—Oil in commercially exploitable quantities has been found in the Jwalamukhi region in India according to the Oil and Natural Gas Commission. Furthermore, deep drilling at Bathula, near Bassi Kalan in Hoshiarpur district, has yielded layers of oil and gas.

The drilling programme this year of Pakistan Petroleum, Ltd., of Karachi, is its biggest ever and is aimed at finding oil and natural gas. Included in its plans are exploratory wells in Karachi, Kandhkot, Karsal (West Pakistan), and Chhatak (East Pakistan), in addition to a development well in the Sui gas-field. Also, a further test well may be drilled.

A site at Engkabang, near Marudi, Sarawak, has been selected for an exploratory oil well and, according to the present programme, drilling would start during the second half of the year, it is reported from Kuching. Preparatory surveys of the area had been completed and work would begin soon on the building of a ramp. Other work to be done before drilling equipment could be moved included the improvement of the present earth road from Lubok Nibong to Engkabang and the building of two access roads from the ramp to the earth road and to the location. The exploratory well at Engkabang would be the first such well to be drilled in Sarawak since 1956.

A new oil-field in the Turfan Basin, China, is expected to yield 100,000 tons of crude oil this year. At the same time the Yumen field is expected to double its output in 1959.

Coal.—A Karachi report says that the Pakistan Industrial Development Corporation has drawn up plans for the complete re-organization of the coal-mining industry of West Pakistan at a cost of some £5,000,000 of which imported machinery and plant would account for about £3,500,000. The aim is to improve the quality of the coal and to meet most of the railway needs, replacing imported coal. In Baluchistan alone there is a coal-bearing area of 1,500 sq. miles containing about 500,000,000 tons of coal which, according to tests, is suitable for coking.

Eight Japanese steel mills have agreed, it has been stated, to buy 720,000 tons of coking coal from Corrimal, on the south coast of New South Wales, Australia, over the next five years. This is in addition to 1,229,000 tons of coking coal Japanese mills contracted to buy recently from Coalcliff, on the south coast, over the same period.

Further deposits of lignite have been found near Palana, Rajasthan, India, and a team of experts is to report on the suitability of these and earlier discoveries for commercial use.

Iron and Steel.—Mr. Lee Austen, a World Bank expert, recently arrived in Pakistan to examine the feasibility of setting up a steel plant in that country. The Pakistan Industrial Development Corporation had prepared a scheme for setting up a plant at an estimated cost of Rs. 170,000,000 in consultation with Krupps, the German concern. The plant's capacity was to be 70,000 tons of steel per year : this could later be increased to 250,000 tons.

Rich iron-ore deposits extending over a large area have been found in the Ratnagiri district of Bombay state, India, according to an official announcement. Bauxite, limestone, and gypsum had also been found in the neighbourhood.

Uranium.—A uranium plant is to be set up in Bihar, India, by the Atomic Energy Commission to process about 500 tons of uranium ore daily, with provision to treat double this quantity. The mill, due to come into operation in three years' time, will cost about Rs. 20,000,000 ; for preliminary work, Rs. 1,000,000 has been set aside.

Cement.—The South Vietnam Government has signed an agreement in Saigon with the United States Operations Mission for exploitation of big lime deposits in Hatien province. The pact provides for a geological survey of the region with a view to developing a cement industry.

Trade Notes

Brief descriptions of developments of interest to the mining engineer

Development in Electric Traction

New developments in the design of electric locomotives for underground use are the subject of some notes which have been issued by the **Hunslet Engine Co., Ltd.,** of Jack Lane, Leeds. Reference is made to patents taken out a year or two ago in South Africa by Dr. H. E. J. Symes, at that time electrical engineer with New Consolidated Gold Fields. Arrangements were made by the company both in South Africa and England to develop and market the project and carry out trials with experimental and prototype units in the South African gold mines.

Basically the Symes patent differential drive consists of two compound-wound d.c. machines coupled to the two input shafts of the differential gearbox. The output from the differential cage is coupled to the locomotive road wheels and when the machines are running at the same speed in opposite directions the locomotive is stationary. The two machines are connected in parallel across the supply, while their shunt fields are in series. Shunt-field variation is by means of a diverter controller. When putting the locomotive in service the two d.c. machines are started as compound motors under light load conditions and run up to the same idling speed. The locomotive is then ready for work. Shunt-field variation speeds up one machine, which motors, and reduces the speed of the other machine, which commences generating. Speed control and electrical braking down to zero are incorporated in one handle of the dead-man type. After reference to power consumption tests the makers point out that the use of differential locomotives reduces the sub-station size for a particular number and type on a system and thus the load factor is improved. Some of the principal dimensions of the 0-4-0 type " 40 " are :—

Gauge of railway, 2 ft., height overall (less trolley), 3 ft. $10\frac{3}{8}$ in., width overall, 3 ft. $2\frac{1}{2}$ in., nominal voltage, 550, power, 40 h.p., speed at maximum power, $6\frac{1}{4}$ m.p.h., tractive effort at starting, 4,400 lb., at $6\frac{1}{4}$ m.p.h., 2,300 lb., and at 12 m.p.h. 1,000 lb.

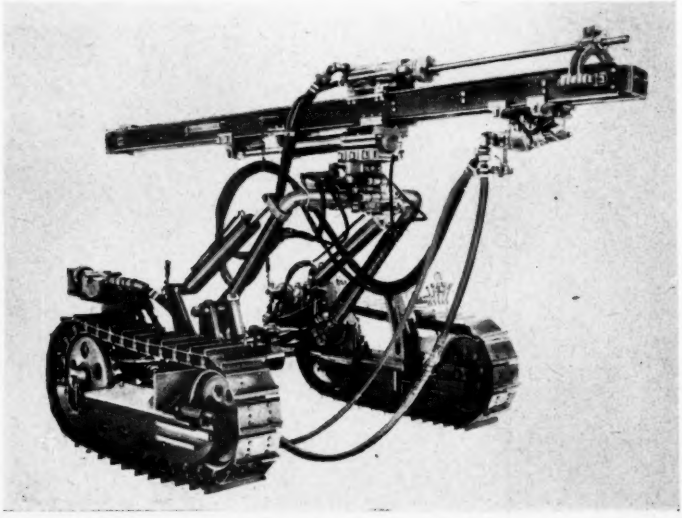
Hunslet Electric Loco

Track-Mounted Drilling Rig

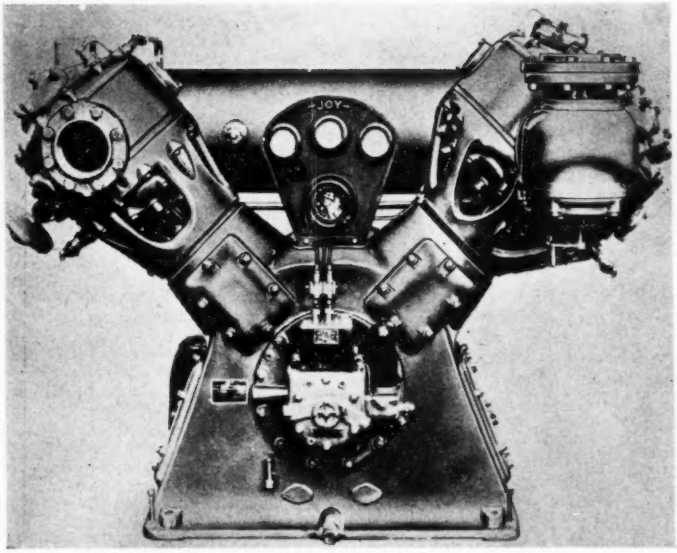
A self-propelled track-mounted drilling rig has recently been introduced by the **Consolidated Pneumatic Tool Co., Ltd.,** of 232, Dawes Road, London, S.W. 6, for completely self-contained large-diameter deep-hole drilling operations in open-cast mines and quarries (as illustrated). Two 6-b.h.p. reversible motors provide the power for propelling the rig at a speed of 2½ m.p.h., while towing a 365-RO-2 " Power Vane " compressor which supplies the air. The rig carries a drilling mast which is retracted to the horizontal position for travelling or positioned at any angle for drilling by means of hydraulic cylinders, these being operated by a large-capacity air-operated hydraulic pump. The unit can also be supplied with a further pair of cylinders for inclining or swinging the drill carriage thus reducing fatigue and making positioning fully automatic. Other features include heavy-duty multiple-disc brakes which eliminate movement during drilling, a throw-out clutch for towing, and a hydraulic drill positioner control panel. The crawler control is of the spring-loaded " deadman " type and gives forward, reverse, turning, and pivoting movements. The unit has a low centre of gravity and this, combined with independent operation of the 10 in. wide tracks, enables stability of the carriage to be maintained in rough conditions. The drill used is the CP. 400 or CP. 450, these being 4 in. and 4½ in. piston units respectively.

Vertical Stationary Compressor

In the June issue of the MAGAZINE attention was drawn to the newly-formed Air Power Division by **Joy-Sullivan, Ltd.,** of 7, Harley Street, London, W. 1, and mention was made of machines which will now be available from British manufacture. One of these is the two-stage vertical compressor shown in the illustration. Four variations of the compressor will be available giving a range of capacties from 400 to 850 c.f.m. free air delivered at pressures up to 125 p.s.i. The control combines maximum compressor efficiency at full load and vacuum unloading for the lowest possible power consumption and there is no power loss due to air friction because the pistons sweep back and forth in a nearly perfect vacuum when operating at no load. All compressed air is passed to the receiver and there is no need to waste air by venting it to atmosphere when the compressor unloads. Synchronous or induction type motors are normally used to power the compressor. Flange mounting is effective and



Consolidated Pnuematic Track Drill



Joy-Sullivan Two-Stage Compressor

saves space, but direct connexion through a flexible coupling or V-belt drive are possible. The flange-mounted motor can be bolted direct to the frame or crankcase making misalignment impossible. For mine and construction work where large supplies of air are required for long periods but not permanently, the WN.102 semi-portable compressor is available. Skid-mounted and with self-contained cooling this machine can be readily transported from site to site.

Novel Bit Remover

The development of an ingenious bit remover is announced by **Holman Brothers, Ltd.,** of Camborne, Cornwall, tests having shown that fracture of rod tapers and damage to bits and their tungsten carbide inserts have been directly caused by hammering the bit body. The Holbit Remover has been produced for $\frac{7}{8}$ in. and 1 in. hexagonal steels which eases considerably the bit removal effort, leaving bit and steel undamaged, and consists of a steel block 4 in. by 2 in. by $2\frac{1}{2}$ in. A groove is machined along the length of the block, shaped to take the angles of a hexagonal drill steel shaft. Opposite the grooved face at each end of the block two angled striking faces are machined. To remove a bit the Remover is placed over the drill steel and touching the back of the bit as shown in the photograph. The angled face furthest from the bit is given a sharp

blow with a heavy hammer which is quite sufficient, it is stated, to remove the most stubborn of bits.

Correction.—It is regretted that the illustration on p.341 of the June issue was of the **Distington** Ropebelt conveyor and not of the Ropex conveyor, as was stated.

Letter to the Editor

Ores of the Witwatersrand

Sir,—I regret that I am obliged to comment on Dr. Haughton's unfortunate letter in your June issue. In supposed correction of a review written by me, he finds it necessary to assure us that the expenditure incurred by the Geological Society of South Africa, in publishing an English translation of Professor Ramdohr's monograph on the Witwatersrand, is in no sense to be regarded as " a contribution to a war effort to combat hydrothermal arguments." No such statement, imputation or suggestion appears in my review. To Dr. Haughton himself, I recommend some meditation on the theme *Honi soit qui mal y pense*; but lest his refutation of a non-existent implication hint that all is not well, permit me to add that I would not be a member of the Society if I lacked confidence that its scientific affairs were being conducted with propriety and integrity.

C. F. DAVIDSON.

St. Andrews.
June 22, 1959.

Personal

A. E. Walker is home from India.

GUY FINLAYSON is home from Argentina.

W. M. WARREN is now in California.

M. L. SOUTHWOOD JONES is returning from Chile.

J. T. CHAPPEL has been appointed a director of Pengkalen, Ltd., and Rambutan, Ltd.

E. S. WATT, chairman of Westralian Oil, Ltd., has left Australia on a visit to Japan.

C. A. COTTON, Emeritus Professor of Geology, Victoria University College, Wellington, has been made K.B.E.

J. D. POLLETT, Director, Geological Survey, Sierra Leone, becomes C.B.E. in the Queen's Birthday Honours.

J. H. M. MCNAUGHTON, Director, Geological Survey, Nyasaland, has been made O.B.E.

C. B. MURRAY, Director of Lands and Survey, Sarawak, was made O.B.E. in the Birthday Honours.

A. F. SKERL, Assistant Commissioner for Mines, Tanganyika, has been awarded the I.S.O. in the Birthday Honours.

B. SPENCER, Senior District Inspector of Mines and Quarries, Scottish Division, Ministry of Power, has been made O.B.E.

P. A. LEWIS, Area Chief Engineer, S.W. Division, N.C.B., becomes M.B.E. in the Queen's Birthday Honours.

ALF WELHAVEN, who died on May 20 in California, aged 77, was a Norwegian by birth and educated at the High School in Fredrikstad. After service in the Norwegian Navy he emigrated to America and took up mining as a profession. From 1903 to 1936 Mr. Welhaven was manager for the Oriental Consolidated Mining Company in Korea, in the last-named year becoming managing director. In 1929, however, he went to the Philippines and until 1949 he was working there for Marsman and Co. Mr. Welhaven had been a Member of the Institution of Mining and Metallurgy for over 40 years.

MATTHEW TERENCE O'REGAN died on June 4, after a serious illness. Mr. O'Regan left the Camborne School of Mines in 1922 and pursued a career in mining which took him to many parts of the world. From Brazil he went to Nigeria in 1926, afterwards working in Yugoslavia, Korea, and India. In the years of the 1939–1946 war he was at Kolar, but on his return he took an active part in the efforts to resuscitate metalliferous mining in Ireland. From 1947 to 1949 Mr. O'Regan was at Avoca and then, until 1953, at Glendalough. After a brief period in India, he was appointed engineer in charge of Mines Inspectorates in Northern Nigeria, a position he held at the time of his death. Mr. O'Regan was a Member of the Institution of Mining and Metallurgy.

ARTHUR TREVENA (TREVE) HOLMAN died in Lisbon on June 6, aged 66. Mr. Holman, who studied engineering at Birmingham University, became a director in the family firm, Holman Bros., Ltd., of Camborne, in 1914, and in 1949 after the death of his cousin, Mr. J. Leonard Holman, became the chairman of the company and, for a considerable time, was joint managing director with Mr. P. M. Holman. He relinquished that appointment last October for health reasons and was succeeded by Mr. J. F. Holman, son of the late Mr. J. L. Holman. During the First World War Mr. Holman served in the Honourable Artillery Company, Royal Field Artillery, and Royal Air Force, while in the 1939–45 War he commanded the 11th (Newquay) Battalion of the Home Guard and was awarded the O.B.E. in 1944. High Sheriff of Cornwall in 1942, he served for many years as a member of the Cornwall Territorial Force Association and as a Governor of Camborne School of Mines. He was also the pioneer in the formation of the Cornish Engines Preservation Society, of which he retained the Chairmanship up to his death, and was a Member of the Institution of Mechanical Engineers, on the Council of which he served, and of the Institution of Production Engineers.

INSTITUTION OF MINING AND METALLURGY

Elections and Transfers

Associate Member to Member.—William Kenneth BROWN (*Glasgow*); William Ronald COWLIN, A.C.S.M. (*Kolar Gold Fields*); Edward Berney HALL, B.Sc., A.R.C.S. (*Calcutta*); David Ronald MITCHELL, A.R.S.M., B.Sc. (*Kuala Lumpur*); Christopher Percy TREMLETT, A.C.S.M. (*Denver*); Martin EISENSTEIN, B.Comm. (*Ballengeich, Natal*).

Associate Member.—Kenneth Cooper BRANSCOMBE, B.Sc. (*Salisbury, S. Rhodesia*); Lionel Alfred GILBERT, B.Sc., B.A. (*London*); Igor Serge LOUPEKINE, Ph.D., B.Sc. (*Nairobi*).

Student to Associate Member.—Juan Stanhope CHESTER, M.Sc., D.I.C. (*Kalulushi*); John Hamilton CRAWFORD (*Fimiston, W. Australia*); Eric Laughton DEMPSTER, A.C.S.M. (*Kenya*); William Stanley HICKSON, A.C.S.M. (*Perak*); John Blair HOWKINS, B.Sc. (*Kitwe*); Thomas Oswald MARTYN, A.C.S.M. (*Peru*); James Frederick PHILLIPS, A.C.S.M. (*Kitwe*); Peter John Hedley RICH, A.C.S.M. (*Perak*); David Cowper TENNENT, A.O.S.M. (*Noranda*).

Affiliate.—John Henry BEAUMONT (*Epsom*); Musiri Govindarau Subba RAU, M.Sc., B.Sc. (*London*); Derek Harold THIXTON (*Carletonville*).

Student.—Rudolf Alexander CAMERER (*Johannesburg*); Michael Frederick ENDEAN (*Camborne*); Leslie John Michael MAYNE (*Camborne*); Kenneth Haigh Cameron MEKIE (*Edinburgh*); Reginald de Lisle MURRAY-SMITH, B.Sc. (*Kitwe*); Michael Brian SHIPP (*Scunthorpe*); Jack Bolitho SIVIOUR (*Sheffield*); Peng Kong Soo (*Birmingham*); Roy Henderson SWAN (*Johannesburg*); Kathleen Gillian WHITE, B.E. (*Kitwe*); Yoke Lum WONG (*Camborne*).

Metal Markets

During June[1]

Copper.—With the approach of the deadline for a strike in the U.S. steel and copper industries during June, opinion has progressively swung round to the view that a strike will be avoided. As a result, prices[2] have tumbled by about £20 per ton, for world production of copper is still running ahead of use. Latterly London and New York have interacted on one another and the custom smelters' price there has fallen 2 cents a pound, to the detriment of the strong Comex price, which has been the mainspring of former strength.

The holiday season is approaching and it is unlikely that any resurgence in consumer demand will be seen now before the fourth quarter of the year. However, whether producers will decide to revert to an austerity regime of cut output remains to be seen, despite their suggestion that they are prepared to be more flexible in their output rate, producers must naturally tend to try to produce at a high and therefore economic rate and adjust the slack by their stocks " in the pipeline."

U.K. April copper consumption was 55,524 tons; production 10,053 tons primary refined and 8,140 tons secondary. Stocks closed the month at 61,080 tons refined and 11,238 tons blister.

Tin.—With declining fears of a U.S. steel strike the call for tin from the U.S.A. has improved somewhat in June. In addition, the control of supplies exercised by the International Tin Agreement keeps them below the general level of world use, so that the market is bound to retain a firm base.

The Buffer Stock manager is now duly selling the U.K. Government's 2,500 tons of tin at a cautious rate and consideration is being given to disposing of the remaining 2,500 in the U.K. stockpile in the same way in due course.

U.K. April consumption was 1,745 tons and production 1,636 tons. Stocks were down to 10,685 tons.

Lead.—Despite periodic utterances of an optimistic nature in the U.S.A., lead remains a depressed metal on world markets. Even without the U.S. quotas the excess of supply over demand would be onerous; with them, the European situation is not enviable. Latest news is that one Canadian producer finds that the opening of the St. Lawrence seaway means that it can ship surplus concentrates to Antwerp as cheaply as quota ore is sent to Chicago.

U.K. April consumption was 29,252 tons and production 7,616 tons.

Zinc.—Zinc continues as popular as lead is unpopular, but the margin[1] between the two is now wider than most people can account for. Nevertheless, whilst important uses hold up and supplies do not press in London, there is no need for an early re-valuation.

U.K. April consumption was 28,006 tons and production was 5,424 tons. Stocks were almost unchanged at 38,643 tons.

Iron and Steel.—The basic situation in the British steel industry is unchanged. Output generally was affected by the Whitsun holidays in May and thus fell a little below the level of the previous month, but production by the strip mills rose. It is the light products, in fact, that continue to enjoy the best conditions, demand for heavy plates and sections being still very sluggish, with no indication of any marked improvement for a while yet. The summer holidays will soon begin to show themselves in lower steel outputs and it will be September before there is again a chance to assess the true market position.

Iron Ore.—Imports of iron ore into the U.K. continue to decline. Arrivals in May totalled only 863,431 tons, against 1,313,554 tons a year previously, making 4,396,248 tons in the first five months of the year as compared with 5,689,986 tons in January-May, 1958.

Aluminium.—Another incursion into the U.K. aluminium market by U.S. producers came to light at the end of June, when I.C.I. entered into an agreement with the Aluminum Co. of America to collaborate in the manufacture of aluminium semis at Waunarlywdd, South Wales. A new company has been formed—Imperial Aluminium Co., Ltd.—with I.C.I. holding 51 of its shares and Alcoa 49. The South Wales plant will be transferred to the new company which is to start operations on August 1. It is interesting to note that while in this country it was announced that the new concern would be able to buy virgin metal from any source, an American statement reports that Alcoa will supply the metal for the company's activities. In view of other similar U.K.-U.S. links it seems that the latter course is more probable.

In Japan, semis manufacturers are asking the Government to permit emergency imports—3,000 tons—to ease the anticipated shortage throughout the year.

Canadian metal continues to be quoted at £180 a ton in the U.K.

Antimony.—During June there was no change in the market position of antimony and the price of

[1] Recent prices, pp. 4, 32.

[2] See Table, p. 32.

[1] See Table, p. 32.

English regulus remains at £197 10s. a ton delivered for 99·6% material.

Arsenic.—There were no changes to report in June and metal is still quoted at £400 a ton.

Bismuth.—Business in this metal continued its normal passage through June with no changes to record in price or demand. The current price is 16s. per lb.

Cobalt.—This metal is still quoted at 14s. per lb. and there has been no change in the market position.

Cadmium.—Consumption of this metal in the U.K. continues at a fairly good rate, although there is still no indication of any price change in the offing. Cadmium is currently quoted at 9s. a lb.

Chromium.—Despite reductions in certain ore prices, the price of chromium metal remains at between 6s. 11d.–7s. 4d. per lb.

Tantalum.—June was another quiet month for this ore and the price remains unaltered at 550s.–600s. nominal.

Platinum.—Prices of this metal, which were raised by the action of speculative buyers in the U.S.A. during May have receded and imported metal is now quoted at £26 10s.–£27 10s. per troy oz. Business is very slack, U.K. and Empire metal remaining quoted at £28 10s.

Iridium.—Iridium is quoted at £24–£26 15s. an oz. and not £24–£24 15s., as was incorrectly quoted in a previous report.

Palladium.—This metal has remained quoted at £7 5s. per troy oz. throughout June.

Osmium.—There has been no alteration in the price of this metal—£23–£32 5s. per troy oz.

Tellurium.—As was noted in the last report tellurium was reduced by a U.K. seller to 14s. per lb., while an American seller advanced its price. The material from the U.S.A. is 99·5% purity and is priced, after duty, at 16s. per lb. This increase was due to the possibility of increased demand and anxiety over future supplies, while the decrease was made by Noranda, because the company has ample supplies.

Tungsten.—It was said in the last report that there was a distinct possibility of tungsten suffering a decline and this situation materialized during June, the latest prices being down to 101s. 6d., with the market still in a depressed state.

Nickel.—Little has happened in this oversupplied market of late and the price remains at £600 a ton.

Chrome Ore.—June proved quite an interesting month for this commodity, with Turkish official minimum export price cut once again. Turkish ore—48% ore, ratio 3 : 1—is now quoted at the equivalent of about £12 a ton f.o.b. The Turkish price is quoted in dollars as 33.50 f.o.b. Rhodesian metallurgical 48% is still quoted at £15 15s. a ton.

Molybdenum.—The molybdenite price of 8s. 11d. was unchanged during June.

Manganese Ore.—While the Indian/U.S. Government barter has been concluded no actual deliveries of ore have been made and it is understood that delivery details are still being discussed. One of the difficulties holding up the finalization of this deal is said to be the fact that the U.S. Government does not wish to take low-grade ore after the expiry of its domestic buying programme for this material in September, 1959.

The c.i.f. price is still nominally quoted at 70d. per unit for 46%–48% material.

Tin, Copper, Lead and Zinc Markets

Tin, minimum 99·75% ; Copper, electro ; Lead, minimum 99·75% ; and Zinc, minimum 98%, per ton.

Date	Tin		Copper		Lead		Zinc	
	Settlement	3 Months	Spot	3 Months	Spot	3 Months	Spot	3 Months
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
June 11	777 0	786 15	234 2½	233 2½	68 12½	70 13¾	88 2½	76 13¾
12	788 0	877 10	213 17½	231 2½	69 2½	71 5	77 8¾	76 17½
15	789 0	789 15	230 17½	230 2½	68 17½	71 0	77 16¼	77 1¼
16	789 0	789 5	226 7½	226 2½	69 12½	71 2½	77 17½	77 2½
17	789 10	789 15	226 2½	226 2½	70 7½	71 11¼	78 11¼	77 8¾
18	790 0	790 5	224 17½	225 7½	69 17½	71 2½	78 18¾	77 15
19	789 10	790 0	224 5	225 12½	70 8¾	71 18¾	79 1¼	77 16¼
22	788 10	789 15	226 7½	227 7½	70 1¼	71 12½	79 2½	77 8¾
23	788 10	789 5	225 7½	226 12½	69 17½	71 12½	79 11¼	77 17½
24	789 0	790 0	220 12½	221 17½	69 8¾	71 6¼	79 0	77 5
25	791 0	791 15	220 12½	221 15	69 6¼	71 6¼	79 13¾	78 7½
26	790 10	791 15	217 12½	218 12½	68 16¼	70 13¾	79 6¼	78 1¼
29	791 0	791 15	219 12½	220 12½	69 2½	70 17½	80 2½	78 12½
30	791 10	792 10	222 17½	222 17½	69 16¼	71 7½	80 1¼	78 13¾
July 1	791 0	792 15	222 12½	222 17½	69 17½	71 1½	80 7½	79 2½
2	791 0	792 15	220 17½	221 12½	69 6¼	70 11¼	80 12½	79 2½
3	791 0	792 15	221 2½	222 2½	69 18¾	71 3¾	80 7½	79 1¼
6	792 0	793 5	219 17½	220 17½	68 17½	70 12½	80 2½	78 18¾
7	792 0	792 15	215 17½	217 5	68 7½	70 1¼	80 10	78 17½
8	792 0	792 5	214 7½	215 15	69 2½	70 7½	80 6¼	79 3¾
9	792 0	791 15	214 17½	215 17½	69 2½	70 61¼	79 17½	79 1¼
10	—	—	—	—	—	—	—	—

Statistics

TRANSVAAL AND O.F.S. GOLD OUTPUTS

	May		June	
	Treated Tons.	Yield Oz.†	Treated Tons.	Yield Oz.*
Blyvooruitzicht	132,000	83,816	132,000	84,421
Brakpan	142,000	16,915	148,000	16,925
Buffelsfontein‡	138,000	51,591	142,000	53,521
City Deep	116,000	24,133	117,000	24,339
Cons. Main Reef	123,000	19,335	117,000	19,621
Crown Mines	230,000	35,487	219,000	35,789
Daggafontein	244,000	49,055	244,000	48,806
Doornfontein‡	92,000	37,790	90,000	37,130
D'rb'n Roodeport Deep	193,000	35,927	192,000	35,748
East Champ D'Or‡	12,500	282	12,000	322
East Daggafontein	102,500	16,992	103,500	17,246
East Geduld	142,000	42,247	142,000	42,246
East Rand P.M.	229,000	57,973	223,000	57,080
Eastern Transvaal Consol	18,700	5,999	18,800	6,122
Ellaton‡	32,000	7,400	32,000	7,400
Freddies Consol.	58,000	14,147	64,000	14,376
Free State Geduld	83,500	65,966	86,000	68,155
Geduld	75,000	13,988	75,000	14,371
Government G.M. Areas‡	51,000	10,603	52,000	10,723
Grootvlei Proprietary	215,000	45,498	215,000	45,485
Harmony Gold Mining	133,000	51,948	141,000	55,135
Hartebeestfontein‡	89,000	48,505	88,000	47,980
Libanon	105,000	24,681	106,000	24,897
Loraine	78,000	15,210	80,000	15,600
Luipaards Vlei‡	100,000	11,597	125,000	14,342
Marievale Consolidated	95,000	23,221	98,000	23,707
Merriespruit‡	—	—	—	—
Modderfontein East	136,000	13,655	141,000	13,576
New Kleinfontein	83,000	10,584	84,000	10,498
New Klerksdorp‡	11,200	1,198	10,700	1,072
President Brand	110,000	88,319	112,500	91,125
President Steyn	107,000	41,200	107,000	41,096
Rand Leases	191,000	28,393	195,000	28,470
Randfontein‡	200,000	14,265	205,000	15,331
Rietfontein Consolid't'd.	16,000	4,137	16,000	4,190
Robinson Deep	55,000	12,292	56,000	11,872
Rose Deep	43,000	5,263	44,000	5,228
St. Helena Gold Mines	150,000	45,002	155,000	47,278
Simmer and Jack	88,000	16,256	85,000	15,659
S. African Land and Ex.	99,000	20,765	101,000	20,972
S. Roodepoort M.R.	29,000	7,011	30,000	7,240
Spaarwater Gold	11,000	3,420	11,000	3,421
Springs	105,000	14,228	105,000	14,333
Stilfontein Gold Mining‡	145,000	69,744	145,000	68,991
Sub Nigel	66,500	15,933	66,500	15,910
Transvaal G.M. Estates	6,600	1,869	7,000	1,879
Vaal Reefs‡	90,500	40,725	92,900	41,400
Van Dyk Consolidated	77,000	14,205	75,000	14,116
Venterspost Gold	130,000	31,883	130,000	31,925
Village Main Reef	26,000	4,680	27,200	4,573
Virginia O.F.S.‡	134,000	31,996	134,000	31,362
Vlakfontein	51,000	18,231	50,500	18,157
Vogelstruisbult‡	91,000	20,276	90,000	20,237
Welkom Gold Mining	101,000	30,754	102,000	31,172
West Driefontein‡	95,000	86,713	96,000	87,638
West Rand Consol.‡	218,000	22,741	217,000	22,510
Western Holdings	126,000	76,745	132,000	80,579
Western Reefs	138,000	36,018	139,000	36,766
Winkelhaak	78,000	19,305	78,000	20,085
Witwatersrand Nigel	18,200	4,386	18,200	4,379

† 249s. 1d. * 249s. 2d. ‡ Gold and Uranium.

COST AND PROFIT IN THE UNION

	Tons milled	Yield per ton	Work'g cost per ton	Work'g profit per ton	Total working profit
		s. d.	s. d.	s. d.	£
Mar., 1958	15,806,300	64 10	46 6	18 4	23,170,987
April	—	—	—	—	—
May	—	—	—	—	—
June*	16,435,500	64 9	46 6	18 3	24,358,945
July	—	—	—	—	—
August	—	—	—	—	—
Sept.*	16,760,400	65 10	46 9	19 1	25,633,898
Oct.	—	—	—	—	—
Nov.	—	—	—	—	—
Dec.	16,540,150	67 7	47 10	19 9	25,934,441
Jan., 1959	—	—	—	—	—
Feb.	—	—	—	—	—
Mar.	16,743,500	68 0	45 4	22 8	25,934,881

* 3 Months.

PRODUCTION OF GOLD IN SOUTH AFRICA

	Rand and O.F.S.	Outside	Total
	Oz.	Oz.	Oz.
July, 1958	1,456,925	42,312	1,499,237
August	1,463,259	36,413	1,499,672
September	1,465,697	36,799	1,502,496
October	1,516,701	44,025	1,560,726
November	1,484,844	32,349	1,517,193
December	1,480,525	40,372	1,520,895
January, 1959	1,506,670	39,515	1,546,187
February	1,472,090	34,618	1,506,708
March	1,561,196	32,271	1,593,467
April	1,616,891	36,815	1,653,706
May	1,641,990	30,371	1,672,361
June	1,665,503	34,465	1,699,968

NATIVES EMPLOYED IN THE SOUTH AFRICAN MINES

	Gold Mines	Coal Mines	Total
October 31, 1958	335,003	32,657	367,660
November 30	332,443	32,851	365,294
December 31	329,234	32,946	362,180
January 31, 1959	350,656	—	—
February 28	396,217	33,859	430,076
March 31	379,257	32,982	412,239
April 30	383,710	33,081	416,791
May 31	385,278	33,186	418,464
June 30	383,903	33,146	417,049

MISCELLANEOUS METAL OUTPUTS

	4-Week Period To May 30		
	Tons Ore	Lead Concs. tons	Zinc Concs. tons
Broken Hill South	27,100	4,322	4,809
Electrolytic Zinc	13,388	710	4,224
Lake George	14,085	1,199	2,353
Mount Isa Mines**	53,782	3,050†	1,675
New Broken Hill	54,220	7,355	11,653
North Broken Hill	29,465	5,757	6,037
Zinc Corp.	64,470	10,953	10,450
Rhodesia Broken Hill*	—	3,600†	7,300†

* 3 Mths. ** Copper 2,775 tons. † Metal.

RHODESIAN GOLD OUTPUTS

	May		June	
	Tons	Oz.	Tons	Oz.
Cam and Motor	32,120	—	31,625	—
Falcon Mines	20,000	3,721	20,000	3,721
Globe and Phœnix	6,000	3,100	—	—
Motapa Gold Mining	20,550	1,497	14,350	1,351
Mazoe	2,738	—	3,105	—
Coronation Syndicate	12,260	—	61,916	—
Phœnix Prince*	—	—	40,430	3,589

* 3 Months.

WEST AFRICAN GOLD OUTPUTS

	May		June	
	Tons	Oz.	Tons	Oz.
Amalgamated Banket	67,408	15,619	64,948	15,444
Ariston Gold Mines	40,000	12,774	36,120	13,085
Ashanti Goldfields	33,500	26,750	34,000	27,000
Bibiani	33,500	7,200	33,500	7,200
Bremang	—	3,973	—	3,607
Ghana Main Reef	11,971	4,302	11,262	4,368
Konongo	6,530	3,865	6,700	3,860
Lyndhurst	—	—	—	—

PRODUCTION OF GOLD AND SILVER IN RHODESIA

	1958		1959	
	Gold (oz.)	Silver (oz.)	Gold (oz.)	Silver (oz.)
January	44,305	46,553	46,489	18,077
February	43,591	21,313	43,366	19,806
March	43,830	8,179	—	—
April	46,587	22,573	—	—
May	46,015	19,937	—	—
June	46,453	20,105	—	—
July	44,244	19,170	—	—
August	47,484	20,549	—	—
September	48,295	21,141	—	—
October	46,311	6,342	—	—
November	47,994	16,435	—	—
December	48,888	30,724	—	—

WESTRALIAN GOLD PRODUCTION

	1957	1958	1959
	Oz.	Oz.	Oz.
January	106,722	66,562	63,924
February	64,949	65,965	65,035
March	67,121	65,420	65,408
April	66,435	60,855	62,686
May	64,886	64,196	64,184
June	65,142	67,929	—
July	74,420	81,106	—
August	75,727	68,610	—
September	64,422	68,744	—
October	64,524	70,128	—
November	65,700	67,562	—
December	66,562	120,106	—
Total	846,610	867,187	—

AUSTRALIAN GOLD OUTPUTS

	4-Week Period			
	To May 29		To June 23	
	Tons	Oz.	Tons	Oz.
Central Norseman	14,168	7,303	14,124	7,567
Crœsus Proprietary	—	—	—	—
Gold Mines of Kalgoorlie	30,077	9,893	40,965	11,225
Golden Horse Shoe*	—	—	—	—
Gt. Boulder Gold Mines*	—	—	—	—
Gt. Western Consolidated	32,074	5,752	33,276	6,203
Hill 50*	—	—	—	—
Kalgurli Ore Treatment	—	—	—	—
Lake View and Star*	—	—	—	—
Moonlight Wiluna*	—	—	8,229	3,661
Morning Star (G.M.A.)	—	—	2,421	686
Mount Ida*	—	—	—	—
New Coolgardie	—	—	—	—
North Kalgurli	27,696	6,856	—	—
Sons of Gwalia	12,248	2,802	—	—
Mount Morgan	—	4,778	—	5,761

* 3 Months

ONTARIO GOLD AND SILVER OUTPUT

	Tons Milled	Gold Oz.	Silver Oz.	Value Canad'n $
January, 1958	779,128	215,462	44,230	7,494,289
February	727,170	219,502	31,562	7,462,598
March	807,458	210,646	35,370	7,248,333
April	785,264	229,361	38,323	7,873,264
May	801,102	228,590	35,712	7,789,644
June	775,384	228,123	37,535	7,745,425
July	750,410	228,960	42,275	7,740,144
August	740,459	218,126	38,940	7,355,406
September	771,115	202,798	31,543	7,006,517
October	801,965	209,006	34,914	7,178,218
November	783,065	230,251	35,097	7,842,435
December	787,573	219,351	30,989	7,490,094
January, 1959	799,178	227,656	41,277	7,700,672
February	727,843	227,981	32,976	7,798,523
March	807,952	223,728	33,045	7,616,425
April	776,583	225,027	32,778	7,712,425

MISCELLANEOUS GOLD AND SILVER OUTPUTS

	May		June	
	Tons	Oz.	Tons	Oz.
British Guiana Cons.	—	—	—	—
Central Victoria Dredging	—	—	—	—
Clutha River	—	570	—	1,335
Emperor Mines (Fiji)*	—	—	—	—
Frontino Gold (Colombia)	—	—	—	—
Geita Gold (Tanganyika)	—	—	—	—
Harrietville (Aust.)	—	—	—	—
Lampa (Peru)†	—	—	—	—
Loloma (Fiji)*	—	—	—	—
New Guinea Goldfields	4,420	1,636	3,684	1,362
St. John d'el Rey (Brazil)	—	—	—	—
Yukon Consol.	—	$76,000	—	$301,000

* 3 Months. † Oz. Silver: Copper, 61 : 85 tons.

OUTPUTS OF MALAYAN TIN COMPANIES IN LONG TONS OF CONCENTRATES

	Apr.	May	June
Ampat Tin	51	46	—
Austral Amalgamated	—	—	—
Ayer Hitam	—	—	—
Batu Selangor	—	—	—
Berjuntai	92½	119	—
Chenderiang	—	—	—
Gopeng Consolidated	—	—	121*
Hongkong Tin	—	—	—
Idris Hydraulic	—	—	—
Ipoh	—	—	—
Jelapang Tin	—	—	—
Kampong Lanjut	62½	44½	—
Kamunting	122	113½	—
Kent (F.M.S.)	—	—	38*
Kepong	—	—	—
Killinghall	—	—	—
Kinta Kellas	—	—	—
Kinta Tin Mines	—	—	63½
Klang River	—	—	—
Kramat	—	—	—
Kuala Kampar	115½	140	—
Kuala Lumpur	—	—	—
Kuchai	—	—	—
Lahat Mines	—	—	—
Larut	—	—	—
Lower Perak	55	42½	—
Malayan	—	—	—
Malaysiam	—	—	—
Pacific Tin Consolidated	—	—	—
Pahang Consolidated	—	—	372*
Pengkalen	—	—	62*
Petaling Tin	—	—	204½*
Puket	—	—	—
Rahman Hydraulic	—	—	—
Rambutan	—	—	30*
Rantau	25	15½	—
Rawang Concessions	—	—	—
Rawang Tin Fields	—	—	—
Renong	—	—	—
Selayang	—	—	—
Siamese Tin Syndicate (Malaya)	16	17	16
Southern Kinta	247	323	—
Southern Malayan	—	—	—
Southern Tronoh	—	—	—
Sungei Besi	—	—	—
Sungei Kinta	—	—	—
Sungei Way	—	—	—
Taiping Consolidated	39	37	—
Tambah	—	—	—
Tanjong	—	—	131*
Tekka	—	—	26*
Tekka-Taiping	—	—	—
Temoh	—	—	—
Tongkah Compound	—	—	—
Tongkah Harbour	29	32	—
Tronoh	—	—	—
Ulu Klang	—	—	—

* 3 Months.

MISCELLANEOUS TIN COMPANIES' OUTPUTS IN LONG TONS OF CONCENTRATES

	May		June	
	Tin	Columbite	Tin	Columbite
Amalgamated Tin Mines	157	—	—	—
Anglo-Burma Tin *	12	—	18	—
Bangrin	44	—	22	—
Beralt	40	124†	35	132†
Bisichi	37	29	31	29½
Ex-Lands Nigeria	41	—	32	—
Geevor	55	—	60	—
Gold and Base Metal	39	8	40	4
Jantar Nigeria	13	24	10¼	30
Jos Tin	13	—	—	—
Kaduna Prospectors	4	—	—	—
Kaduna Syndicate	15	—	—	—
Katu Tin	27	—	22	—
Keffi Tin	—	—	—	—
London Nigerian Mines	—	—	—	—
Mawchi Mines	—	—	—	—
Naraguta Extended	6	—	5½	—
Naraguta Karama	5	—	4	—
Naraguta Tin	—	—	—	—
Renong Consolidated	—	—	—	—
Ribon Valley (Nigeria)	9	2	10	1½
Siamese Tin Syndicate	59	—	14	—
South Bukeru	—	—	—	—
South Crofty	76	—	80	—
Tavoy Tin	—	—	—	—
Tin Fields of Nigeria	—	—	—	—
United Tin Areas of Nigeria	—	—	—	—

* 3 months. † Wolfram.

SOUTH AFRICAN MINERAL OUTPUT

April, 1959

Gold	1,654,036 oz.
Silver	167,142 oz.
Diamonds	213,370 carats.*
Coal	3,417,673 tons.
Copper	(*a*) 35 tons in matte and copper-gold concentrates. (*b*) 4,557 tons of 99·37%.
Tin	196 tons concs.
Platinum (concentrates, etc.)	—
Platinum (crude)	—
Asbestos	16,342 tons.
Chrome Ore	63,293 tons.
Manganese Ore	89,856 tons.
Lead Concs.	13 tons.

* Mar., 1959.

IMPORTS OF ORES, METALS, ETC., INTO UNITED KINGDOM

		April	May
Iron Ore	tons	754,344	863,431
Manganese Ore	"	41,776	25,780
Iron and Steel	"	58,490	57,455
Iron Pyrites	"	13,784	9,090
Copper Metal	"	36,627	37,171
Tin Ore	"	3,417	3,940
Tin Metal	"	—	28
Lead	"	23,538	14,364
Zinc Ore and Conc.	"	4,583	4,519
Zinc	"	14,985	12,763
Tungsten Ores	"	305	379
Chrome Ore	"	12,539	7,658
Bauxite	"	26,146	14,576
Antimony Ore and Concs.	"	—	1,000
Titanium Ore	"	42,807	28,605
Nickel Ore	"	—	—
Tantalite/Columbite	"	14	74
Sulphur	"	25,669	30,142
Barytes	"	2,663	2,913
Asbestos	"	8,779	11,264
Magnesite	"	1,318	1,749
Mica	"	332	435
Graphite	"	437	448
Mineral Phosphates	"	127,003	103,640
Molybdenum Ore	"	279	538
Nickel	cwt.	80,759	43,404
Aluminium	"	399,005	303,517
Mercury	lb.	113,995	93,210
Bismuth	"	88,049	136,947
Cadmium	"	194,508	176,148
Cobalt and Cobalt Alloys	"	11,540	210,702
Selenium	"	27,867	12,525
Petroleum Motor Spirit	1,000 gals.	80,457	76,671
Crude	"	968,388	980,827

Prices of Chemicals

The figures given below represent the latest available.

		£	s.	d.
Acetic Acid, Glacial	per ton	106	0	0
" " 80% Technical	"	97	0	0
Alum, Comml.	"	25	0	0
Aluminium Sulphate	"	16	10	0
Ammonia, Anhydrous	per lb.		2	0
Ammonium Carbonate	per ton	59	0	0
" Chloride, 98%	"	26	0	0
" Phosphate (Mono- and Di-)	"	102	0	0
Antimony Sulphide, golden	per lb.		3	0
Arsenic, White, 99/100%	per ton	47	10	0
Barium Carbonate (native), 94%	"	Nominal		
" Chloride	"	53	0	0
Barytes (Bleached)	"	20	0	0
Benzene	per gal.		5	2
Bleaching Powder, 36% Cl.	per ton	30	7	6
Borax	"	45	0	0
Boric Acid, Comml.	"	75	10	0
Calcium Carbide	"	40	17	9
" Chloride, solid, 70/75%	"	13	5	0
Carbolic Acid, crystals	per lb.		1	6
Carbon Bisulphide	per ton	62	10	0
Chromic Acid (ton lots)	per lb.		2	2½
Citric Acid	per cwt.	11	0	0
Copper Sulphate	per ton	76	0	0
Creosote Oil (f.o.r. in Bulk)	per gal.		1	2
Cresylic Acid, refined	"		6	10
Hydrochloric Acid 28° Tw.	per carboy		13	0
Hydrofluoric Acid, 59/60%	per lb.		1	1
Iron Sulphate	per ton	3	17	6
Lead, Acetate, white	"	124	0	0
" Nitrate	"	116	0	0
" Oxide, Litharge	"	107	5	0
" Red	"	105	5	0
" White	"	117	0	0
Lime Acetate, brown	"	40	0	0
Magnesite, Calcined	"	20	0	0
" Raw	"	9	0	0
Magnesium Chloride, ex Wharf	"	16	0	0
" Sulphate, Comml.	"	15	10	0
Methylated Spirit, Industrial, 66 O.P.	per gal.		6	3
Nitric Acid, 80° Tw.	per ton	37	10	0
Oxalic Acid	"	129	0	0
Phosphoric Acid (S.G. 1·750)	per lb.		1	4
Pine Oil	per ton	Nominal		
Potassium Bichromate	per lb.		1	2½
" Carbonate (hydrated)	per ton	74	10	0
" Chloride	"	21	0	0
" Iodide	per lb.		7	3
" Amyl Xanthate	"	Nominal		
" Ethyl Xanthate	"	Nominal		
" Hydrate (Caustic) flake	per ton	118	0	0
" Nitrate	per cwt.	4	1	0
" Permanganate	per ton	198	10	0
" Sulphate, 50%	"	21	1	0
Sodium Acetate	"	75	10	0
" Arsenate, 58–60%	"	Nominal		
" Bicarbonate	"	15	0	0
" Bichromate	per lb.		1	0
" Carbonate (crystals)	per ton	Nominal		
" " (Soda Ash) 58%	"	13	15	0
" Chlorate	"	91	0	0
" Cyanide 100% NaCN basis	per cwt.	6	6	6
" Hydrate, 76/77%, solid	per ton	33	0	0
" Hyposulphite, Comml.	"	32	15	0
" Nitrate, Comml.	"	29	0	0
" Phosphate (Dibasic)	"	40	10	0
" Prussiate	per lb.		1	0½
" Silicate	per ton	11	0	0
" Sulphate (Glauber's Salt)	"	9	15	0
" " (Salt-Cake)	"	10	0	0
" Sulphide, flakes, 60/62%	"	38	12	6
" Sulphite, Comml.	"	27	10	0
Sulphur, American, Rock (Truckload)	"	14	0	0
" Ground, Crude	"	17	10	0
Sulphuric Acid, 168° Tw.	"	12	0	0
" " free from Arsenic, 140° Tw.	"	7	0	0
Superphosphate of Lime, 18% P_2O_5	"	14	18	6
Tin Oxide	"	Nominal		
Titanium Oxide, Rutile	"	172	0	0
" White, 25%	"	85	0	0
Zinc Chloride	"	95	0	0
" Dust, 95/97% (4-ton lots)	"	109	0	0
" Oxide	"	95	0	0
" Sulphate	"	32	0	0

Share Quotations

Shares of £1 par value except where otherwise stated.

GOLD AND SILVER:	June 8, 1959 £ s. d.	July 1, 1959 £ s. d.
SOUTH AFRICA:		
Blinkpoort (5s.)	4 17 6	4 15 0
Blyvooruitzicht (2s. 6d.)	1 8 6	1 7 0
Brakpan (5s.)	5 6	5 0
Buffelsfontein (10s.)	2 10 0	2 14 0
City Deep	1 1 9	1 2 9
Consolidated Main Reef	1 0 6	19 6
Crown Mines (10s.)	1 7 0	1 6 6
Daggafontein (5s.)	1 12 0	1 9 6
Dominion Reefs (5s.)	15 3	14 9
Doornfontein (10s.)	1 13 9	1 13 9
Durban Roodepoort Deep (10s.)	1 15 6	1 15 0
East Champ d'Or (2s. 6d.)	2 3	2 3
East Daggafontein (10s.)	9 6	9 0
East Geduld (4s.)	1 6 3	1 4 3
East Rand Ext. (5s.)	1 13 3	1 12 9
East Rand Proprietary (10s.)	2 10 0	2 4 0
Freddies Consol.	2 6	2 6
Free State Dev. (5s.)	11 3	11 6
Free State Geduld (5s.)	9 15 6	9 13 9
Free State Saaiplaas (10s.)	1 1 0	1 1 9
Geduld	3 10 0	3 5 0
Government Gold Mining Areas (4s.)	3 9	3 6
Grootvlei (5s.)	19 6	19 6
Harmony (5s.)	2 2 9	2 3 6
Hartebeestfontein (10s.)	3 10 3	3 4 6
Libanon (10s.)	11 6	11 0
Loraine (10s.)	1 11 9	1 13 3
Luipaards Vlei (2s.)	9 9	9 3
Marievale (10s.)	1 8 0	1 7 9
Merriespruit (5s.)	4 6	5 0
Modderfontein B (3s.)	2 3	2 3
Modderfontein East	16 3	15 9
New Kleinfontein	5 6	5 9
New Pioneer (5s.)	2 5 0	2 2 3
New State Areas (15s. 6d.)	2 0	2 0
President Brand (5s.)	3 10 9	3 9 6
President Steyn (5s.)	1 12 9	1 11 3
Rand Leases (9s. 3d.)	7 0	6 9
Randfontein	1 6 0	1 4 0
Rietfontein (3s. 2d.)	5 0	5 0
Robinson Deep (5s. 6d.)	7 9	7 3
Rose Deep (6s. 6d.)	14 3	10 9
St. Helena (10s.)	3 4 3	3 9 0
Simmer and Jack (1s. 6d.)	2 3	2 3
South African Land (3s. 6d.)	1 3 0	1 2 3
Springs (5s.)	2 0	1 9
Stilfontein (5s.)	2 2 6	2 2 3
Sub Nigel (8s. 6d.)	13 9	12 9
Vaal Reefs (5s.)	2 4 3	2 4 3
Van Dyk (3s.)	5 3	3 9
Venterspost (10s.)	18 0	17 6
Virginia (5s.)	7 3	6 9
Vlakfontein (10s.)	1 1 0	1 0 0
Vogelstruisbult (10s.)	9 0	9 3
Welkom (5s.)	1 5 3	1 4 6
West Driefontein (10s.)	7 0 0	6 16 6
West Rand Consolidated (10s.)	1 6 3	1 5 3
West Witwatersrand Areas (2s. 6d.)	3 5 6	3 6 0
Western Holdings (5s.)	7 0 0	8 15 0
Western Reefs (5s.)	1 10 3	1 9 0
Winkelhaak (10s.)	1 2 6	1 4 6
Witwatersrand Nigel (2s. 6d.)	1 6	1 0
Zandpan (10s.)	1 0 3	19 9
RHODESIA:		
Cam and Motor (2s. 6d.)	9 0	8 3
Chicago-Gaika (10s.)	15 0	15 0
Coronation (2s. 6d.)	4 6	4 3
Falcon (5s.)	8 0	8 0
Globe and Phœnix (5s.)	1 13 0	1 11 9
Motapa (5s.)	9	9
GOLD COAST:		
Amalgamated Banket (3s.)	1 0	1 0
Ariston Gold (2s. 6d.)	4 0	4 0
Ashanti Goldfields (4s.)	16 9	16 9
Bibiani (4s.)	2 6	2 6
Bremang Gold Dredging (5s.)	2 6	2 3
Ghana Main Reef (5s.)	2 6	2 3
Konongo (2s.)	2 0	1 9
Kwahu (2s.)	4 0	4 0
Western Selection (5s.)	5 6	5 6
AUSTRALASIA:		
Gold Fields Aust. Dev. (3s.), W.A.	2 3	2 3
Gold Mines of Kalgoorlie (10s.)	9 6	9 6
Great Boulder Propriet'y (2s.), W.A.	13 6	12 9
Lake View and Star (4s.), W.A.	1 9 0	1 9 9
London-Australian (2s.)	9	7½
Mount Morgan (10s.), Q.	14 3	14 0
New Guinea Gold (4s. 3d.)	2 0	1 6
North Kalgurli (1912) (2s.), W.A.	11 9	10 6
Sons of Gwalia (10s.), W.A.	3 9	3 0
Western Mining (5s.), W.A.	11 0	10 9

	June 8, 1959 £ s. d.	July 1, 1959 £ s. d.
MISCELLANEOUS:		
Fresnillo ($1·00)	1 14 0	1 11 0
Kentan Gold Areas	2 0 0	2 3 6
St. John d'el Rey, Brazil	3 17 6	4 0 0
Yukon Consolidated ($1)	5 3	7 0
COPPER:		
Bancroft Mines (5s.), N. Rhodesia	1 6 3	1 3 3
Esperanza (2s. 6d.), Cyprus	1 9	1 7½
Indian (2s.)	5 0	4 9
MTD (Mangula) (5s.)	9 9	9 3
Messina (5s.), Transvaal	5 16 6	5 8 3
Mount Lyell, Tasmania	1 6 6	1 5 3
Nchanga Consolidated, N. Rhodesia	12 3 9	12 6 3
Rhokana Corporation, N. Rhodesia	28 5 0	28 15 0
Roan Antelope (5s.), N. Rhodesia	8 0	8 0
Tanganyika Concessions (10s.)	2 9 0	2 9 0
LEAD-ZINC:		
Broken Hill South (1s.), N.S.W.	10 9	10 0
Burma Mines (3s. 6d.)	1 9	1 9
Consol. Zinc Corp. Ord.	3 5 9	3 3 3
Lake George (5s.), N.S.W.	3 9	3 3
Mount Isa, Queensland (5s. Aust.)	2 0 3	1 18 6
New Broken Hill (5s.), N.S.W.	1 16 9	1 13 3
North Broken Hill (5s.), N.S.W.	4 1 0	3 16 3
Rhodesia Broken Hill (5s.)	9 6	8 9
San Francisco (10s.), Mexico	19 3	19 3
TIN:		
Amalgamated Tin (5s.), Nigeria	8 0	7 6
Ampat (4s.), Malaya	9 9	8 6
Ayer Hitam (5s.), Malaya	1 17 0	1 17 0
Beralt (5s.), Portugal	1 10 6	1 7 0
Bisichi (2s. 6d.), Nigeria	3 9	3 9
Ex-Lands (2s.), Nigeria	2 3	2 0
Geevor (5s.), Cornwall	1 7 3	1 3 6
Gold Base Metals (2s. 6d.), Nigeria	1 0	1 0
Hongkong (5s.), Malaya	4 9	4 6
Jantar Nigeria (3s.)	3 9	3 9
Kaduna Syndicate (2s.), Nigeria	2 0	2 0
Kamunting (5s.), Malaya	11 9	11 3
Malayan Tin Dredging (5s.)	17 3	17 6
Mawchi Mines (4s.), Burma	2 0	2 6
Naraguta Extended (5s.), Nigeria	6	9
Pahang (5s.), Malaya	8 9	5 0
Siamese Synd. (5s.)	8 9	7 9
South Crofty (5s.), Cornwall	4 0	4 0
Southern Kinta (5s.), Malaya	1 3 3	1 2 3
Southern Malayan (5s.)	14 3	14 3
Southern Tronoh (5s.), Malaya	13 6	12 6
Sungei Besi (4s.), Malaya	1 0 3	7 6
Sungei Kinta, Malaya	16 0	14 0
Tekka (12s. 6d.), Malaya	3 9	3 9
Tronoh (5s.), Malaya	14 3	13 9
United Tin Areas (2s. 6d.), Nigeria	9	9
DIAMONDS:		
Anglo American Investment	13 12 6	14 0 0
Consol African Selection Trust (5s.)	19 6	1 0 0
Consolidated of S.W.A. Pref. (10s.)	11 0	11 0
De Beers Deferred (5s.)	7 3 3	8 1 9
FINANCE, ETC.		
African & European (10s.)	4 6 0	4 6 6
Anglo American Corporation (10s.)	9 15 0	9 9 0
Anglo-French Exploration	1 10 0	1 16 3
Anglo Transvaal 'A' (5s.)	2 7 0	2 7 0
British South Africa (15s.)	4 17 6	4 13 0
British Tin Investment (10s.)	1 1 9	1 1 0
Broken Hill Proprietary	2 5 6	2 6 0
Camp Bird (10s.)	11 6	11 0
Central Mining	4 6 6	3 19 6
Central Provinces Manganese (10s.)	1 8 6	1 10 9
Consolidated Gold Fields	3 14 0	3 10 6
Consolidated Mines Selection (10s.)	2 6 0	2 5 0
East Rand Consolidated (5s.)	2 3	2 0
Free State Development (5s.)	11 3	11 6
General Exploration O.F.S. (2s. 6d.)	5 9	5 6
General Mining and Finance	7 1 3	7 1 3
H.E. Proprietary (5s.)	15 0	15 6
Johannesburg Consolidated	3 8 3	3 6 0
London & Rhod. M. & L. (5s.)	8 0	7 9
London Tin Corporation (4s.)	9 3	8 9
Lydenburg Est. (5s.)	19 3	19 6
Marsman Investments (10s.)	1 9	1 7
National Mining	2 6	2 6
Rand Mines (5s.)	5 2 6	4 17 6
Rand Selection (5s.)	2 17 0	2 16 0
Rhodesian Anglo American (10s.)	4 5 0	4 5 0
Rhodesian Corporation (5s.)	3 6	3 3
Rhodesian Selection Trust (5s.)	16 6	15 0
Rio Tinto (10s.)	2 7 6	2 7 6
Selection Trust (10s.)	5 16 0	5 13 0
South West Africa Co. (3s. 4d.)	12 6	12 6
Union Corporation (2s. 6d.)	3 5 6	3 3 3
Vereeniging	6 8 9	6 8 3
West Rand Inv. Trust (10s.)	3 1 3	2 19 6

THE MINING DIGEST

A RECORD OF PROGRESS IN MINING, METALLURGY, AND GEOLOGY

In this section abstracts of important articles and papers appearing in technical journals and proceedings of societies are given, together with brief records of other articles and papers; also notices of new books and pamphlets and lists of patents on mining and metallurgical subjects.

Underground Loading by Floating Chute

In the June issue of *Optima*, a quarterly review published by the Anglo American Corporation of South Africa, there is a description of a new type of loading chute designed by Mr. R. Blair, consulting mechanical engineer to the Corporation, from which the following notes are abstracted. It is pointed out that in deep shafts the weight of a correctly-dimensioned steel-wire rope could be equal to or even exceed that of the total attached load—that is, the weight of the ore and the skip. In practice, the size of the rope is kept to the minimum that will meet these requirements and fall within the limits set on grounds of safety. Thus, as loading stations for ore and waste rock are usually situated close to the bottom of shafts, a large amount of elongation of the rope—and, therefore, vertical displacement of the skip—during loading cannot be avoided economically. In a shaft with a loading station 6,000 ft. below the surface, a skip load of 10 tons will cause the rope to stretch between 7 ft. and 8 ft. in average conditions.

When a skip is being loaded it slowly descends the 7 ft. or 8 ft., by which time some of the ore strikes the cross-bar of the bridle or bounces clear of the skip and falls to the bottom of the shaft. Some of the spillage can be prevented by increasing the length of the bridle, so that, when the skip descends to its lowest point during loading, the bridle does not obstruct the flow of ore from the chute, but owing to the drop of several feet between the chute and the skip some of the ore still tends to bounce clear and fall to the bottom of the shaft. In any case, the increased length of the bridle adds to the weight of the skip and is less rigid than the normal construction and it calls for a higher headgear to allow a normal margin of safety against over-winding.

The problem has now been solved by means of the new type of loading chute, which compensates automatically for the stretching of the rope, for, as the skip is being loaded, the chute descends exactly in line with the skip. At the same time, automatic interlocking of doors prevents ore from being discharged from the chute unless the skip is in exactly the right position.

The " Blair free-floating loading chute," as it is called, can be installed in a conventional underground loading station without appreciable modification of existing equipment. It consists of a box-shaped container closed on three sides, with an opening in the front for the passage of the ore. Its length corresponds to the distance of its maximum travel and it is guided vertically on rails. The chute is suspended in front of the door of the measuring bin by means of a pneumatic cylinder, the free end of the piston rod of the single-acting cylinder being connected to a bearer of the station steelwork.

The sequence of operations for loading a skip is as follows :—

Ore is passed into the measuring bin through a feed chute controlled by two doors, the upper door being for normal operation and the lower for use in emergency; for instance, should the upper door be jammed by a large piece of ore, which would allow smaller pieces of rock to continue to flow, the emergency door would be closed to stop the flow.

As soon as the measuring bin is full the main door of the feed chute is closed; unless that door is closed and the skip is in the correct loading position, an interlocking mechanism prevents the discharge door of the measuring bin from being opened. The correct loading position for the skip is opposite the lip of the floating chute (which, owing to the pressure of air in the cylinder, is in its highest position). The discharge door of the measuring bin is then opened and ore pours into the skip. The rope begins to stretch and the skip descends slowly. When the skip has moved a short, predetermined distance, however, tipping rollers near the bottom of the skip come into contact with a lever on each side of the chute frame. These levers, which are coupled to a common shaft, operate a spring-loaded exhaust valve, which allows air to escape from the upper cylinder; and as the supporting air escapes the chute is allowed to fall by gravity. The rate of falling is controlled by the angular displacement of the levers—that is to say, a slight downward pressure on the levers causes the chute to descend slowly and if the levers are depressed further the chute will move faster. The chute's floating-valve gear is so designed that, when the skip comes to rest, the chute will stabilize itself in that position. Thus, the chute will accurately follow the movement of the skip, maintaining a constant distance between them and loading can take place without spillage. When the loaded skip is hoisted the chute moves up to its original loading position.

Various safety devices have been incorporated in the design. Provided that the skip is positioned at the correct loading point in relation to the chute, the discharge door of the measuring bin may be opened; but if the skip is lowered too far and engages the exhaust-valve levers before loading is started the bin door is locked. This device ensures that loading can be started only when the equipment is in a

position that will allow for the full extent of the stretching of the rope.

If the skip is accidentally lowered beyond the lowest point of the chute's travel a slipping device comes into action; the exhaust-valve levers are automatically unlatched and there is no damage to the equipment. When the skip ascends to the correct loading position the unlatched levers are returned automatically to their operating position.

If the compressed-air supply fails the floating chute falls to the lowest position of its travel (since it is no longer supported by the air pressure in the suspension cylinder) and, when the chute is in this position, the discharge door from the measuring bin is locked.

It is therefore virtually impossible to discharge a load of ore unless the skip is in the correct loading position.

The floating chute may be operated with equal effect by either pneumatic or hydraulic pressure. In each case the whole operation can be controlled by an operator at a central control desk. The same principle is adaptable to other work that involves compensation for the stretching of ropes during loading and a method of cage loading using a similar system is now being developed.

Resources of the Bushveld Complex

In the July issue of *Platinum Metals Review*, published by Johnson, Matthey and Co., Ltd., there is an article by C. A. Cousins on the Bushveld Igneous Complex, from which the following notes are abstracted. As is well known platinum occurs in South Africa chiefly in the Merensky Reef, which itself forms part of the complex. This rests upon a floor of sedimentary rocks of the Transvaal System. Ths floor is structurally in the form of an immense oval basin, 300 miles long and 100 miles broad. The sediments forming the floor have been extensively altered by thermal metamorphism, indicative of the high temperature of the molten igneous rocks which solidified to form the complex. These rocks consist of a vast body of basic, magnesium-rich rocks, the silica content of which gradually, although not regularly, increases upwards. Overlying this basic zone, whose predominant rock type is either norite or gabbro, lie sheets of the red Bushveld granite.

Both geological and economic interest centres around the mass of basic rocks. They have been the subject of intensive study by geologists from all over the world and present a number of fascinating problems, many of which are still unsolved.

The basic rocks are exposed as outcrops in three areas covering over 5,000 square miles. Two of these areas lie at the eastern and western ends of the Bushveld and form wide curved belts, trending parallel to the sedimentary rocks which they overlie and dipping inwards towards the centre of the Bushveld at similar angles. The western belt has a flat sheet-like extension reaching the western boundary of the Transvaal. The third area extends northwards and cuts outside the sedimentary basin. Its exact relationship to the other outcrops within the basin has not as yet been solved. The eastern and western belts contain the more important economic zones. Geologists divide them into four main zones—namely, the Chill Zone, the Critical Zone, the Main Zone, and the Upper Zone. The Chill Zone grades into the Critical Zone, estimated to be from four to five thousand feet thick, in which the most valuable minerals are found. Within this zone is a remarkable sequence of layered rocks which, although obviously igneous in origin, show all the characteristics of an unusually regular sedimentary series. They consist of alternations of pyroxenites, anorthosites, and norites. Layered within these rocks are regular seams of chrome ore, ranging in thickness from near an inch to more than eight feet, while near the top of the zone occurs the platinum-carrying Merensky reef.

A remarkable feature of the Critical Zone is that individual bands can be traced around the entire outcrop of the complex. The chrome seams and the Merensky reef retain their individuality with only minor variations wherever they have been prospected and boreholes show them to continue unaltered in character down to depths of 3,000 ft.

Merensky Reef

The platinum-carrying Merensky reef has been prospected over distances of 75 miles to 80 miles along both the eastern and western outcrop belts. Platinum values are persistent but in some areas values are consistently higher than in others.

It is this reef which is mined by Rustenburg Platinum Mines, Ltd., at the two sections of its property, the Rustenburg section a few miles to the east of that town and the Union section some 60 miles to the north. The discovery of platinum in the Merensky reef in 1925 led to a considerable outburst of activity in platinum mining at a number of places where the reef outcropped, but this boom was short-lived and only two mining companies survived. These were merged in 1931 to form Rustenburg Platinum Mines, Ltd. In 1947 the Union Platinum Mining Co., Ltd., was formed to work the Merensky reef further north, but in 1949 this company was amalgamated with the Rustenburg company and now constitutes the Union section of Rustenburg Platinum Mines, Ltd. Over the intervening period the output from this source has grown very substantially and Rustenburg now constitutes the world's largest producer of the platinum metals and in fact the only major producer whose prime activity is the extraction of the platinum metals.

The platinum is not found in the pure state, but is a composite of platinum and the other five platinum-group metals, their relative proportions showing variations from one area to another. Platinum is the predominant metal, followed by palladium, with smaller amounts of ruthenium, rhodium, osmium and iridium, together with traces of gold. A proportion of the platinum is present as "native" metal, invariably alloyed with iron (ferro-platinum), while the remainder occurs as the arsenide and sulph-arsenide, sperrylite and cooperite. The ore invariably contains a few per

cent of the sulphides of iron, nickel and copper. The nickel and copper are extracted as a by-product from the platinum concentrates, adding appreciably to the value of the ore.

The Merensky reef in its typical section is a coarsely-crystalline aggregate of pyroxene and felspar, with sulphide mineralization. It underlies a finer-grained bank of a similar rock and rests with an extremely sharp contact on a band of white anorthosite. Thin seams of chrome ore, usually less than an inch thick, are found on both the top and bottom contacts. In some areas, however, one of these chrome seams may be absent. The ore within or adjacent to these chrome bands is generally the richest in platinum. A feature of the reef which makes for easy mining is its regularity of dip and strike, the evenness of its values and its constancy in thickness.

Dykes and faults are rare in the two mines controlled by Rustenburg Platinum Mines. The only underground complication is the occasional occurrence of what are known as "potholes." These are roughly elliptical areas in which the reef suddenly becomes displaced into the footwall and is often somewhat disturbed and broken. The reef can however be mined out in a considerable proportion of potholes. Their origin is still a mystery.

The reef has been proved by drilling down dip on the Rustenburg and Union mines and their potential ore reserves are very considerable.

Resources

In addition to the platinum content of the Merensky reef, which represents the world's greatest reserve of this metal and its sister elements, nickel and copper are being extracted as valuable by-products.

The chrome seams of the Bushveld, while of lower grade than the Rhodesian or Turkish ores, form the major proportion of the total known chrome reserves of the world. Their continuity in thick seams over scores of miles of strike and their persistence in depth as proved by deep drilling, make for easy and cheap mining.

The titano-magnetite seams of the Main Zone show the same persistency and continuity, but have not been exploited to date. Titanium is now assuming importance in metallurgy and there is little doubt that treatment of these ores will be attempted in the future. Contained in the titano-magnetite ore is a persistent fractional percentag of vanadium. The total reserves of titanium and vanadium in these iron ores must be very large.

Trade Paragraphs

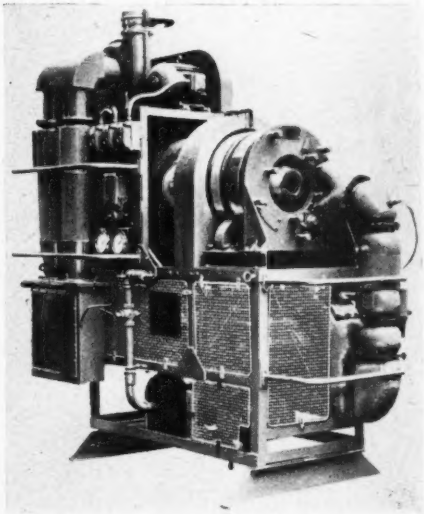
Armour Hess Chemicals, Ltd., of 4, Chiswell Street, London, E.C. 1, is the name under which Hess Products, Ltd., and the chemical division of Armour Chemical Industries, Ltd., have been merged. Among their products, it may be recalled, are the cationic nitrogen derivatives of fatty acids, among applications of which are flotation reagents.

Ferodo, Ltd., of Chapel-en-le-Frith, Stockport, announce that Mr. T. R. Earnshaw, who was recently appointed a director of the company, has assumed responsibility for export sales on the retirement of Mr. F. L. Harrap at the end of May. Mr. Earnshaw joined the associated company, **Turner Brothers Asbestos Co., Ltd.,** nearly 20 years ago, of which he had been export sales manager for a time.

Heyes and Co., Ltd., of Wigan, refer in a recent note to the continued success of their luminous shaft signalling indicator which has been supplied to four divisions of the N.C.B. It is being installed at Pye Hill, Askern, Mosley Common, and Prestonlinks collieries and a new order has been received from the N.C.B. West Midlands Division (Warwickshire Area) for installation of the indicator at Kingsbury colliery.

Dowty Mining Equipment, Ltd., of Ashchurch, Glos., in a recent note refer to the success which has attended the company's participation in the Cleveland Coal Show, at which they exhibited to American Engineers British hydraulic roof-support systems. As a consequence, it is stated, a number of United States companies are considering the adoption of fully-mechanized longwall mining using the company's Roofmaster system.

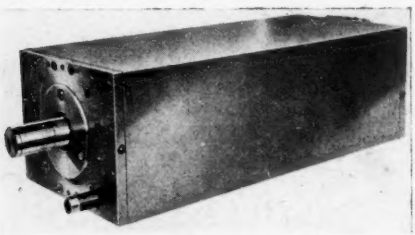
Dunford and Elliott Process Engineering, Ltd., of Linford Street, London, S.W. 8, make available some notes on a small self-contained drying unit suitable for processing a wide range of materials in the form of powders, filter cakes, granules, etc., which is a packaged version of their rotary louvre continuous dryer. The dryer, which is illustrated, has a holding capacity of about 1 cu. ft. of material and the drying time may be from 5 minutes to 60 minutes according to conditions. The unit is estimated to be capable of evaporating 100 lb. of water per hour. The installation consists of a



rotary louvre horizontal drum mounted on four adjustable supporting rollers and driven by a ½-b.h.p. motor through a single-reduction gearbox, two fans, inlet and exhaust, powered by a 1-b.h.p. motor with a vee-rope drive, an air heater with combustion chamber fitted with a burner and hand control cock and a dust collector attached to the exhaust hood.

Magnetic Equipment Co., Ltd., of Lake Works, Portchester, Hants. announce that they are at present engaged on an order for the Dutch State Mines to supply 44 of their 400 tons per hour vibratory feeders for handling a wide range of coal sizes from fine dust to medium lumps. They are to be used in conjunction with an automatic weighing equipment for mixing of coal in specified grades according to ash content. The feeders are available with capacities up to 1,800 tons per hour and are used also in ore handling and other heavy duties.

Newman Industries, Ltd., of Yate, Bristol, make available some details of a new flameproof motor for underground service, which as may be seen from the illustration, is of unusual design. The motor is continuously rated at 75 h.p., 1,470 r.p.m. on a 50-cycle 3-phase supply. The starting and break-down torques are twice the full load value and the starting current is 4½ times the full load current



when switched direct on line. The motor is Class "B" insulated but with 5 gallons of cooling water flowing per minute the temperature rise measured by change of resistance method does not, in fact, exceed 55° C. and is, therefore, well within the Class "A" limits. The water jacket round the stator is complete in itself and none of the motor components form part of its construction so that there is no danger of water leakage into the motor. It is designed for working pressures up to 500 p.s.i. A thermostat mounted on the motor windings has its leads brought into the terminal box for connecting in the motor control circuit as a precaution against overloading or the winding reaching too high a temperature in the event of the water supply being cut off.

Logan Mining Machinery Co., Ltd., of Lochee, Dundee, draw attention to their S.G. sprayer for colour washes, insecticides, or fireproofing mixtures. This is a unit designed for a variety of applications, particularly where electric power or compressed air—the usual motivating power—is remote from the spraying area. Thus it is convenient for operations underground. Where compressed air is not available within a reasonable distance a bottle may be used. The rate of spraying is between 60 and 120 gallons per hour, varying with the viscosity, the volume concentration of the solid phase of the suspensions, and the number and type of nozzles fitted. As examples ordinary whitewash or insecticide can be sprayed at a rate of 750 sq. yd. per hour and a fireproofing mixture of two parts stone dust and one part sodium silicate solution at 450 sq. yd. per hour. The standard version of the sprayer is 5 ft. 3 in. long by 30 in. dia. and weighs approx. 600 lb. The tank is tested to 200 p.s.i. and is fitted with relief valve (set to 100 p.s.i.), pressure gauge, manually-operated stirrer, lifting lugs, steady legs, and a 10-in. dia. removable cover, permitting access to the interior for routine cleaning.

J. and E. Hall, Ltd., of Dartford, and **Thermotank, Ltd.,** of Govan, Glasgow, recently announced that they are proposing to amalgamate. The first named company are principally engaged in the manufacture of refrigerating machinery and the second are designers and manufacturers of many types of air-conditioning equipment. The combined business will be known as **Hall-Thermotank, Ltd.** The announcement states further that Lord Dudley Gordon, the present chairman of J. and E. Hall, Ltd., will be president of Hall-Thermotank, Ltd., the chairman of which will be Mr. I. M. Stewart, who is chairman of Thermotank, Ltd., and the deputy-chairman Mr. J. F. E. d'A. Willis, a director of J. and E. Hall, Ltd. The other directors will be Mr. J. D. Farmer (joint managing director of J. and E. Hall, Ltd.), Mr. A. Greenfield (joint managing director of J. and E. Hall, Ltd.), Mr. W. S. Hayes (a director of J. and E. Hall, Ltd.), Mr. F. McPherson (joint managing director of Thermotank, Ltd.), and Mr. J. K. W. MacVicar (joint managing director of Thermotank, Ltd.)

An offer is being made on behalf of the new organization to the shareholders of Vent-Axia, Ltd., fan makers and manufacturers of ventilating equipment, to acquire all the ordinary stock of that company If this offer is accepted, Mr. J. C. Akester, chairman and managing director of Vent-Axia, Ltd., will join the board of the new company.

Atlas Copco AB, of Stockholm, issue some notes on the Jet rock-drill which has achieved success in the Rand and O.F.S. gold mines, where over 250 are now in use. Designed to cut mining costs on high-speed development and shaft sinking the drill has been specially developed for South African conditions and is a 3-in. machine suitable for short-hole or deep-hole drilling. Because of its power to weight ratio and speed of action, the drill is described as being capable of a 30% to 40% increase on previous drilling results and can be operated by one man. Equipped with an improved retractable pusher leg when used as a drifter, or fitted with a tee-handle and front head weight for shaft sinking, the drill is 15 lb. to 20 lb. lighter than comparable drills and only 3 lb. heavier when fitted with pusher leg than standard 2⅞-in. combination drills. Features incorporated include a new double opening, direct flow valve, which combines heavy impact and increased drilling capacity with economy of compressed air and smooth, vibrationless running. One-hand finger-tip control is obtained by the close grouping of all control levers and throttles on the back head. Additional operation efficiency is obtained by the use of only one air hose and one water hose on each machine. Improvement in the design of the retractable air leg enables quicker re-positioning during continuous drilling and reduces the number of steel changes. In drilling top holes the operation of the air leg facilitates more frequent changes of position to maintain the optimum feed angle and feed pressure. The improved feed pressure also makes it easier to handle in broken ground.